Exhibit 1

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EINGEGANGEN
24. Sep. 2008
v. FÜNER EBBINGHAUS FINCK HANO

Date: 19.09.08

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Applicant/Proprietor
Worthington Armstrong Venture

Transmission of the certificate for a European patent pursuant to Rule 74 EPC

The certificate for a European patent is herewith transmitted.

The European patent specification can be downloaded from the EPO publication server **https://publications.european-patent-office.org** (see OJ EPO 2005, 126).

Note:
A corrected title page of the European patent specification will be published, if the bibliographic data have been changed after completion of the technical preparations.

For the Examining Division

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URKUNDE

Es wird hiermit bescheinigt, dass für die in der Patentschrift beschriebene Erfindung ein europäisches Patent für die in der Patentschrift bezeichneten Vertragsstaaten erteilt worden ist.

CERTIFICATE

It is hereby certified that a European patent has been granted in respect of the invention described in the patent specification for the Contracting States designated in the specification.

CERTIFICAT

Il est certifié qu'un brevet européen a été délivré pour l'invention décrite dans le fascicule de brevet, pour les Etats contractants désignés dans le fascicule de brevet.

Europäisches Patent Nr.	European patent No.	Brevet européen n°
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Patentinhaber	Proprietor of the patent	Titulaire du brevet

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(54) **Locking connector**

Arretierverbindungsstück

Connecteur de verrouillage

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Description

BACKGROUND OF THE INVENTION

[0001] Suspended ceilings are used extensively in commercial and industrial buildings. In such ceilings, a metal grid framework of interconnected main beams and cross beams is hung from a structural ceiling by wires. The grid supports acoustical panels in rectangular openings formed in the grid.

[0002] This invention relates to locking connectors used in the grid to join a pair of opposing cross beams and a main beam at grid intersections.

[0003] Suspended ceilings having metal beams interconnected into a grid that supports panels are well known. (U.S. Patents 5,839,246 or U.S. 6,178,712, for instance).

[0004] The grid in such ceilings has, at each grid intersection, a pair of opposing cross beams and a main beam that form a connection.

[0005] Each cross beam in such a connection has a connector at its end that is thrust, or stabbed-in, from opposing sides of the main beam, through a slot in the main beam. The connectors are all identical.

[0006] The connector that is first inserted into the slot is prevented from being withdrawn back out of the slot by the cantilevered latch in the connector, in the form of a pivoted flexible leaf spring. Such latch, which is integral with the connector base and formed therefrom by punching, is biased toward an open position. The latch, which is cantilevered at an angle from the base of the connector, flexes toward a closed position under the restraint of the side of the slot when the connector is stabbed through the slot to make the connection, but which then reflexes back to its biased rest position to prevent withdrawal of the connector back out of the slot.

[0007] Another connector on an opposing cross beam, identical to the first connector thrust through the slot, is then stabbed through the slot in the reduced space in the slot alongside the first. The latch on the connector contacts the side of the slot close to the latch pivot, and is flexed toward a closed position.

[0008] In inserting particularly the second connector into the slot, with a linear stab-in motion, substantial work and force are necessary to make the connection.

[0009] This resistance arises virtually immediately as the second connector into the slot enters the slot, and continues throughout the travel of the connector until it is seated in a locked position, as described below, with the first connector into the slot.

[0010] Both connectors interconnect when the second connector into the slot is fully inserted. Detents formed from the connector base, in the form of bulbs, that have a cam side and a locking side, and the ends of the connectors, flex and reflex to engage in what is sometimes referred to as a connector-to-connector lock, or "handshake" lock. Such a "handshake" connection between the connectors prevents the connectors from being pulled apart lineally out of the slot. The connectors are kept laterally and vertically together by the slot in the main beam.

[0011] In the seated locked position, the second connector is horizontally aligned with the first connector within the confines of the slot, so that the locking detents on the connectors are engaged and retained at the same level to form the connector-to-connector lock. Generally, the second connector must be either elevated or depressed as it passes into the slot to achieve such horizontal alignment. Hence, the profile of the leading edge of the connector is tapered to guide the connector during its travel through the main beam slot.

[0012] Such connectors of the generic kind are disclosed, for instance, in U.S. 5,839,246 or U.S. 4,317,641. This prior art refers to a locking connector for a suspended ceiling grid as described in the preamble of claim 1.

SUMMARY OF THE PRESENT INVENTION

[0013] The object of the present invention is to provide a locking connector that takes much less force, and less work, to make the connection.

[0014] There is less work and less force necessary, because, in inserting the second connector into the reduced area of the slot of the main beam, (1) there is a delay in the contact between the locking latch and the side of the slot, so that during the delay, (2) elements in the ensuing connection are positioned while offering the least resistance from frictional forces to such positioning, and (3) when contact between elements does occur, the elements are positioned to offer the least resistance to making a connection.

[0015] To achieve the above, the locking latch, which in its unflexed position, must extend laterally far enough out from the base of the connector to prevent withdrawal of the first connector through the slot before the second connector is inserted, is formed with a curved portion before extending in straight lever fashion.

[0016] This, as set forth in (1) above, delays contact between the latch and the side of the slot, when the second connector is inserted into the slot and, as set forth in (2) above, such contact is made further out along the latch from the pivot point, closer to the end of the latch, creating a longer lever arm, so that less force is needed to close the latch.

[0017] The outward end of the locking latch in an unflexed position, extends to the same position as the prior art straight latch pivoted at a sharp, acute angle. This position is necessary, so that the connector cannot be withdrawn after the latch passes through the slot.

[0018] Also, during the delay in (1) above, the second connector into the slot is being positioned vertically by the taper on the leading end of the connector, which engages either the top or bottom of the slot, to the same horizontal level as the first connector, without frictional resistance created in the connection of the prior art, where the locking latch, virtually immediately, forces the

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first and second connection laterally together.

[0019] By adjusting the second connector into the slot more quickly vertically as it travels through the slot, the locking detents and connector ends that engage together by flexing, are in a position, as set forth in (3) above to offer the least resistance to such engagement.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Figure 1 is a right side elevational of a connection of two cross beams through a slot in the main beam, showing the connectors of the invention engaged in a connector-to-connector lock.

Figure 2 is a right side elevational view of the connector of the invention, shown in the connection of Figure 1.

Figure 2a is a top sectional view of the connector of the invention, taken on the line A-A of Figure 2, with an enlarged circled portion showing the latch of the invention.

Figures 3 and 3a are views of a prior art corresponding to the views of Figures 2 and 2a.

Figure 3 is a side elevational view of a prior art connector.

Figure 3a is a top sectional view of a prior art connector taken on the line A-A of Figure 3, with an enlarged circled portion showing a prior art latch.

Figure 4 is a group of graphs, 4a, 4b, and 4c which represent the forces involved in making a connection.

Figure 4a is a graph of the force necessary to overcome resistance in making the connection of the prior art.

Figure 4b is a graph of the force necessary to overcome resistance in making the connection of the invention.

Figure 4c is a graph of the forces represented in 4a and 4b, overlapped.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0021] In the present drawings, a connection of the invention is shown in Figures 1, 1a, and the invention is shown more clearly in Figure 2 and 2a. In the present connection, main beam 20, shown in cross section, extends longitudinally in a ceiling grid. Identical connectors 21 and 22 have been stabbed through a slot 23 in the web 25 of the main beam 20 and interconnect. The connectors 21 and 22 are connected respectively to cross beams 26 and 27 by rivets at 28. In the connection, the following occurs:

(1) End 30 of connector 21 engages detent 31 to form a connector-to-connector connection, as does end 32 of connector 22 engage detent 33;

(2) Locking latches 40 on connector 21 and connector 22 are in an unflexed position;

(3) Backstops 35 and 36 on connectors 21 and 22 secure the ends 30 and 32 in the connector-to-connector lock;
and

(4) Connectors 21 and 22 are kept laterally and vertically constrained within slot 23 by the cross sectional configuration of the connectors, as well known in the art.

[0022] The general configuration so far described conforms to the prior art.

[0023] In making the connection shown in Figures 1 and 1a , and in the cited patents, a first connector, either connector 21 or 22, both being identical, is thrust or stabbed through the slot 23 in the prior art manner. In this explanation, it will assume connector 21 is first thrust through the slot.

[0024] Locking latch 40 contacts side of slot 23 and is flexed enough to allow the latch 40 to pass through slot 23 and reflex back to a rest position, in a one way movement. In this position, the first connector 21 through the slot is retained within the slot 23.

[0025] The second connector 22 is then thrust through the slot 23 along side the first connector 21 through the slot 23. Again, locking latch 40 contacts side of slot 23, but now there is less room in the slot because a connector has already been inserted. The second connector 22 into the slot, as it is thrust through the slot 23, flexes the latch 40 toward a closed position, until the latch passes through the slot after which it flexes open to a rest position. The connectors 21 and 22 also form a connector-to-connector lock at this point, as seen in Figure 1, wherein the detents 31 and 33 and the beam ends 30 and 32 have flexed and then reflexed into a locked position, at rest.

[0026] In these stab-in connections, as the second connector into the slot, for instance connector 22, travels through the slot 23 to a seated position, after the first connector 21 into the slot has been inserted, the following occurs:

(1) The second connector 22 is adjusted vertically within the slot 23.

(2) The second connector 22 is forced laterally by a side of the slot 23 against the first connector 21.

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(3) The locking latch 40 on the second connector 22 is flexed toward a closed position by a side of the slot 23 until the latch 40 passes through the slot 23, and then it springs open to a rest position as seen for instance in Figure 1.

(4) The locking detents 31 and 33 and connector ends 30 and 32 on the first and second connectors 21 and 22 are flexed apart as they contact one another, and then reflexed into a locking position.

[0027] In the prior art, (1) through (4) above overlapped or occurred virtually simultaneously, so that the force and work required to complete a connection 10 was not only the sum of the forces necessary to overcome the sum of the individual resistances created by (1), (2), (3) and (4) referred to immediately above, but also the force and work to overcome the friction created when forces (1) , (2) , (3) and (4) overlapped, or occurred simultaneously. These frictional resistances included:

a. The friction between the latch 40 on the second connector 22 and the side of the slot 23 as the second connector 22 was being positioned vertically in the slot 23.

b. The friction laterally between the base of the connectors 21 and 22.

c. The friction between the top or bottom of the second connector 22 and the top or bottom of the slot 23 as the second connector 22 was being positioned vertically within the slot 23.

d. The friction between the detents 31 and 33 and ends 30 and 32 on the first connector 21 into the slot and second connector 22 into the slot 23 as the second connector 22 was being vertically positioned within the slot 23.

[0028] In the prior art, in an attempt to reduce the total force and work required, the taper 37 or slope on the leading edge of a prior art connector 15, as seen in Figure 3, was made at a gradual incline, so the frictional forces could be spread throughout the length of the insertion, as the second connector into the slot 23 was being adjusted vertically.

[0029] The present invention reduces substantially the force necessary to overcome the resistance from the frictions (a), (b), (c) and (d) above and the forces necessary in (3) above to flex the locking latch 40 of the invention toward a closed position, and in (4) above to flex the detents 31 and 33 and ends 30 and 32 relative to one another to create the connector-to-connector interlock.

[0030] As in the prior art, in the present invention the cantilevered leaf spring latch 40 continues to be formed, as by punching, from the connector base 39, as seen, for instance, in Figures 2 and 2a. The latch of the prior art, designated 10 as seen in Figures 3 and 3a, is in the form of a straight lever 11, pivoted at 12. It forms an acute sharp angle with the base 13 of prior art connector 15.

[0031] In the present invention, the latch of the invention 40, as seen in Figures 2 and 2a, herein, is formed from the base 41 with a radius 42, for instance 0,1 cm (0,04 inches), before extending in straight lever fashion. The straight portion 43 of the latch of the invention 40 forms an angle of about 429 with the base 41. Such a curve in locking latch 40 increases the distance 46 the second connector 21 or 22, enters into the slot 23 before it contacts the side of the slot 23 at 47 to create a resistance from such latch of the invention 40 against the side of the slot 23. Such a curved locking latch of the invention 40 also reduces the distance 48 the latch of the invention 40 is in contact with the side of the slot 23 as it is being flexed toward a closed position as it passes through the slot 23, since it contacts the latch 40 closer to the end of the latch than does prior art straight latch 10.

[0032] Representative dimensions for the locking latch 40 of the invention are shown in Figure 2a.

[0033] Further, the first contact of the latch of the invention 40 with the side of the slot 23 is further out from the point 51 of the latch of the invention 40 where it is joined to on the base 41, since part of the curved part of the latch of the invention 40 extends in the plane of the base 41 and is not exposed to contact by the side of the slot 23. Point 51 is the cutting start and the bending start of the latch of the invention 40 as seen in Figure 2a.

[0034] Thus, the force exerted by the side of the slot 23 as the latch of the invention 40 passes through the slot is applied further from the pivot point 51 than in the prior art, thus requiring less force to pivot the latch of the invention 40, than in the prior art straight lever latch 10, since the force has a greater lever arm in the latch of the invention 40 when it meets the side of slot 23 as it is thrust into the connection.

[0035] Thus, less force over a shorter distance is required to collapse the latch of the invention 40 than was required to collapse latch 10 in the prior art. This results in substantially less work that has to be done to make a connection. This beneficial effect in one connection, is multiplied by the many connections required in forming a ceiling grid for a suspended ceiling.

[0036] In the connection improved by the present invention, during the time the connector is being inserted, it is necessary to adjust the connector vertically, so that when fully inserted, the connector fits vertically into the slot 23 .

[0037] Since the force necessary to collapse the latch 10 of the prior art was substantial, and arose near the leading edge of the connector, the taper that guided the connector vertically to its fully seated position so that the connector was in place vertically when fully inserted, was gradual, to limit the added resistance at any one point in the insertion.

[0038] Thus, even when the connector-to-connector interlock was being created, wherein the detents were

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flexing, the connector was still being adjusted vertically, in view of such necessity to make the taper gradual rather than abrupt, thereby creating still more resistance.

[0039] In the present invention, the taper 38 at the leading edge of the connector 21, 22 is made relatively abrupt, at a steeper angle, so that a relative immediate adjustment is made vertically to the connector as it is being inserted into the slot 23. Even though a more steep, immediate adjustment would normally require a greater insertion force than that of a gradual insertion, there is less, rather than more force required. This reduction in force is obtained by the delayed contact of the locking latch of the invention 40 with the side of slot 23, since there is virtually no drag or resistance from the locking latch of the invention 40.

[0040] There is a further benefit that is achieved by early vertical positioning of the connector within the slot 23 during insertion. As the detents 31 and 33, and the ends 30 and 32 of the first and second connectors of the invention 20 and 21 come into contact, the detents and ends are at a position relative to one another, vertically, where there is least resistance to flexing of these elements laterally into the locking position. Whereas in the prior art, contact was made between detents and ends, and force was exerted between these elements, off-center from their most flexible position, the force required to flex the detents and ends, was again substantial.

[0041] Figures 3 and 3a show a prior art connector, while Figures 2 and 2a show a locking connector of the present invention.

[0042] As seen in Figures 3 and 3a, prior art latch 10 in the form of straight lever 11, is pivoted at an acute angle to base 13 of a prior art connector 15. Dotted line 17 represents, in the enlarged portion, the side of slot 23 as the connector 15 of the prior art is inserted into the slot 23. The prior art connector 15 travels the distance at 16 before it encounters the side of the slot at 19, which is at a distance 18 from the end of the prior art latch 10.

[0043] In Figures 2 and 2a, there is shown the connector of the invention 22, which is identical to the connector of the invention 21, with the latch of the invention 40. Again, as in Figure 3a, dotted line 17 in the enlarged portion, represents the side of slot 23 as the connector 22 is inserted into the slot 23. The connector 22 travels the distance 46 before it encounters the side of the slot 23 at 47. This is a distance 48 from the end of the latch of the invention 40.

[0044] The benefits of the present invention over the prior art are shown graphically in Figures 4a, 4b and 4c.

[0045] Figure 4, including 4a, 4b, and 4c, shows the resistances encountered in a prior art connection compared to the forces encountered in a connection with the improved connector of the invention.

[0046] In the prior art, the line from 80 to 81 represents the resistance encountered during the initial insertion of the second connector into the slot, while the latch 10 is being flexed from its initial contact with the side of the slot 23, until the resistance reaches its highest at about 27 pounds at point 81.

[0047] The contact of the straight lever 11 of prior art latch 10 is relatively close to the pivot 12 during this travel. At 81, there is a drop off in resistance during travel to point 82 to about 10 pounds. The straight lever latch 10 of the prior art during this drop off, contacts the side of the slot 23 further out along its straight lever 11, as it travels through the slot 23, so less force is necessary, since the lever arm is longer than at the initial contact.

[0048] At 82 there is a rise again in resistance due to the flexing of the detents 31 and 33 and connector ends 30 and 32 while they are forming a connector-to-connector lock. The resistance rises to point 83 at which point the connector-to-connector lock is completed, and all elements have reflexed to a rest position with no further resistance or movement occurring.

[0049] The forces required to overcome the resistance encountered in making a connection with the improvement of the invention is shown graphically in Figure 4a. The same movement of the second connector 22 into the slot 23, having the latch of the invention 40, is shown, as was shown with the prior art connector, in Figure 4a. Initial contact with the side of the slot 23 occurs at 90 and rises to 91 where there is a resistance of about 14 pounds. There is a very slight drop off in resistance as the latch of the invention 40 passes through the slot. The resistance then rises to point 93 at about 16 pounds while the connector-to-connector lock is being formed as the detents 31 and 33 and connector ends 30 and 32 are flexing, after which there is a drop off at point 94, where all resistance ends after the connector-to-connector lock is formed.

[0050] The force necessary, and the distance over which the force must be applied, is obviously remarkably less, in making the connection, with the locking connector of the present invention.

[0051] Figure 4c overlaps the charts of Figures 4a and 4b with the locked position of the prior art connection, and the connection of the invention as an overlapped common point along the horizontal axis at 96. ΔX in the chart represent the distance of the delay in contact between the prior art latch 15, and the latch of the invention 40, with the side 17 of the slot 23, as the second connector into the slot is being inserted. Again, Figure 4c, in chart form, represents the substantial reduction in force, and work necessary to make the present connection, over that to make the prior art connection.

Claims

1. A locking connector (21, 22) for a suspended ceiling grid comprising a main beam (20) and cross beams (26, 27),

   - wherein the locking connector (21) is designed to be stabbed through a slot (23) in the main beam (20) to lock with an opposing identical

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locking connector (22) already in the slot (23) and has a cantilevered locking latch (40) being integral with and pivoted from a base (41) in the locking connector (21), and
- wherein, when the locking connector (21, 22) is stabbed through the slot (23) in the main beam (20), the locking latch (40) can be forced by a side of the slot (23) to flex toward the base (41) to permit the locking latch (40) to pass through the slot (23), and when the locking connector (21, 22) has been stabbed through the slot (23), the locking latch (40) can flex back to its relaxed position wherein it is pivoted away from the base (41),

characterized in that the locking latch (40) is formed with a curved portion before extending in straight lever fashion.

2. The locking connector according to claim 1, **characterized in that** the curved portion forms a radius of about 0.1 cm (0.04 inches).

3. The locking connector according to claim 1, **characterized in that** the locking latch (40) has a straight portion (43) which forms an angle of about 42° with the base (41).

4. The locking connector according to claim 1, **characterized in that** a delay in contact between the side of the slot (23) and the locking latch (40) is provided when the locking connector (21, 22) is stabbed through the slot (23).

Patentansprüche

1. Arretierverbindungsstück (21, 22) für ein Hängedeckengitter, das einen Hauptträger (20) und Querträger (26, 27) aufweist, wobei

- das Arretierverbindungsstück (21) für ein Stekken durch einen Schlitz (23) in dem Hauptträger (20) zum Verriegeln mit einem gegenüberliegenden identischen, bereits in dem Schlitz (23) vorhandenen Arretierverbindungsstück (22) ausgelegt ist und eine auskragende Arretierlasche (40) aufweist, die ein Stück mit dem Arretierverbindungsstück (21) bildet und aus einer Basis (41) in dem Arretierverbindungsstück (21) herausgeschwenkt ist,
- die Arretierlasche (40), wenn das Arretierverbindungsstück (21, 22) durch den Schlitz (23) in dem Hauptträger (20) gesteckt ist, von einer Seite des Schlitzes (23) zwangsweise zu der Basis (41) hin gebogen werden kann, so dass die Arretierlasche (40) in der Lage ist, durch den Schlitz (23) hindurchzugehen, und
- die Arretierlasche (40), wenn das Arretierverbindungsstück (21, 22) durch den Schlitz (23) hindurchgesteckt ist, sich in ihre entspannte Position zurückbiegen kann, in der sie von der Basis (41) weggeschwenkt ist,

dadurch gekennzeichnet,

- **dass** die Arretierlasche (40) mit einem gekrümmten Abschnitt versehen ist, bevor sie sich wie ein gerader Hebel erstreckt.

2. Arretierverbindungsstück nach Anspruch 1, **dadurch gekennzeichnet, dass** der gekrümmte Abschnitt einen Radius von etwa 0,1 cm (0,04 Zoll) bildet.

3. Arretierverbindungsstück nach Anspruch 1, **dadurch gekennzeichnet, dass** die Arretierlasche (40) einen geraden Abschnitt (43) hat, der mit der Basis (41) einen Winkel von etwa 42° bildet.

4. Arretierverbindungsstück nach Anspruch 1, **dadurch gekennzeichnet, dass** eine Verzögerung beim dem Kontakt zwischen der Seite des Schlitzes (23) und der Arretierlasche (40) vorgesehen ist, wenn das Arretierverbindungsstück (21, 22) durch den Schlitz (23) gesteckt wird.

Revendications

1. Connecteur de verrouillage (21, 22) pour une grille de plafond suspendu comprenant une poutre principale (20) et des traverses (26, 27),

- dans lequel le connecteur de verrouillage (21) est conçu pour être planté à travers une fente (23) dans la poutre principale (20) pour se verrouiller avec un connecteur de verrouillage identique opposé (22) déjà dans la fente (23) et comporte un loquet de verrouillage en porte-à-faux (40) étant une partie intégrante d' une base (41) et pivoté depuis celle-ci dans le connecteur de verrouillage (21), et
- dans lequel, lorsque le connecteur de verrouillage (21, 22) est planté à travers la fente (23) dans la poutre principale (20), le loquet de verrouillage (40) peut être forcé par un côté de la fente (23) pour fléchir vers la base (41) pour permettre au loquet de verrouillage (40) de passer à travers la fente (23), et lorsque le connecteur de verrouillage (21, 22) a été planté à travers la fente (23), le loquet de verrouillage (40) peut fléchir en retour vers sa position relâchée dans laquelle il est pivoté à écart de la base (41),

caractérisé en ce que le loquet de verrouillage (40)

(18)

est formé avec une partie incurvée avant de s'étendre à la manière d'un levier rectiligne.

2. Connecteur de verrouillage selon la revendication 1, **caractérisé en ce que** la partie incurvée forme un rayon d'environ 0,1 cm (0,04 pouces).

3. Connecteur de verrouillage selon la revendication 1, **caractérisé en ce que** le loquet de verrouillage (40) comporte une partie rectiligne (43) qui forme un angle d'environ 42° avec la base (41).

4. Connecteur de verrouillage selon la revendication 1, **caractérisé en ce qu'**un retard de contact entre le côté de la fente (23) et le loquet de verrouillage (40) est prévu lorsque le connecteur de verrouillage (21, 22) est planté à travers la fente (23).

FIG. 1

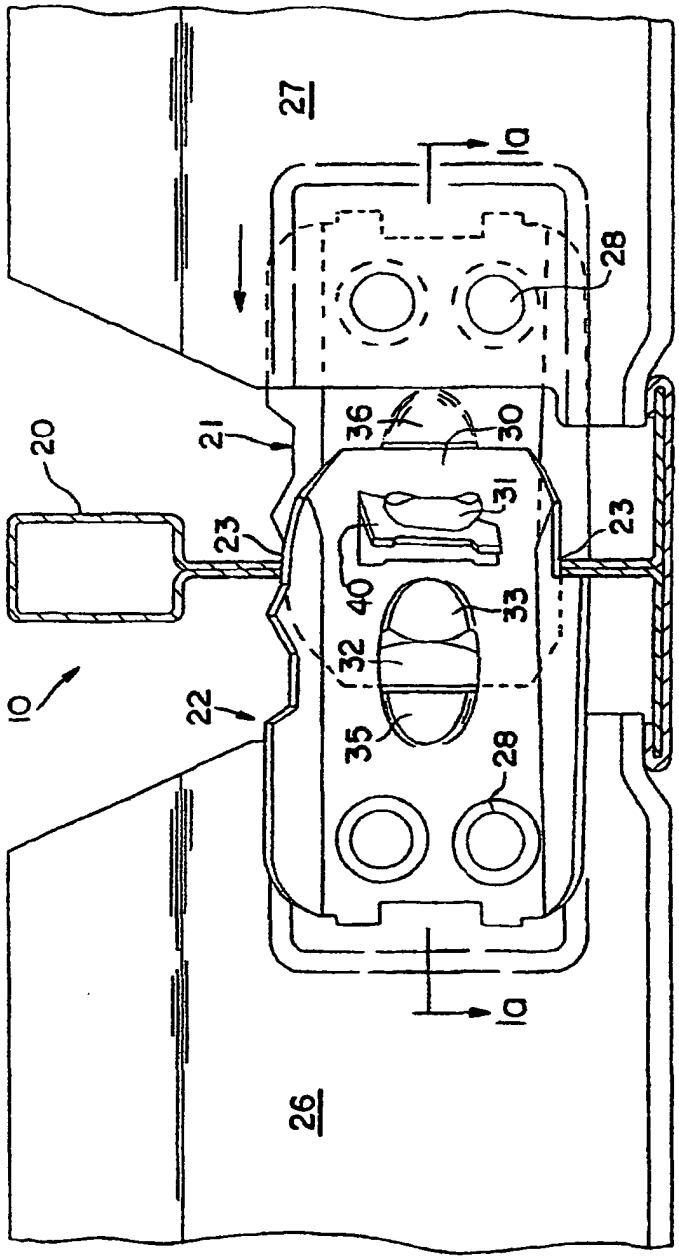
27
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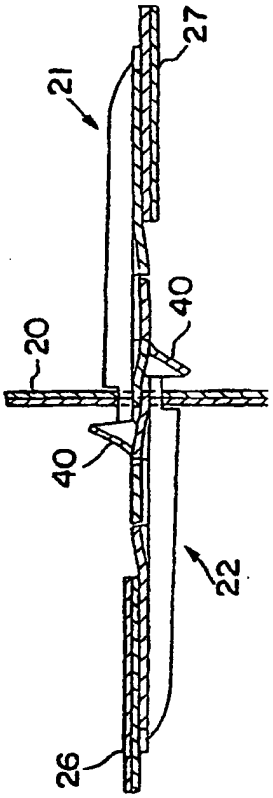
FIG. 1a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22
26

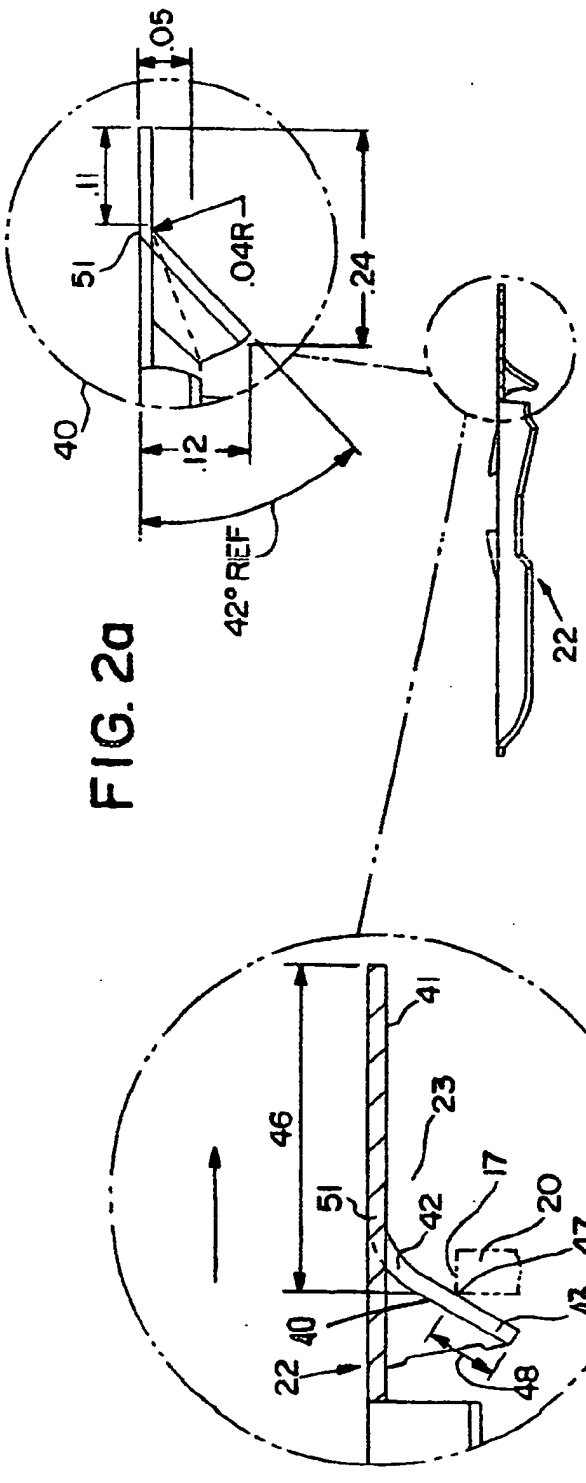
.05
11
51
.04R
24
40
12
42° REF
22
41
46
23
51
42
17
20
47
43
40
22
48

FIG. 2a

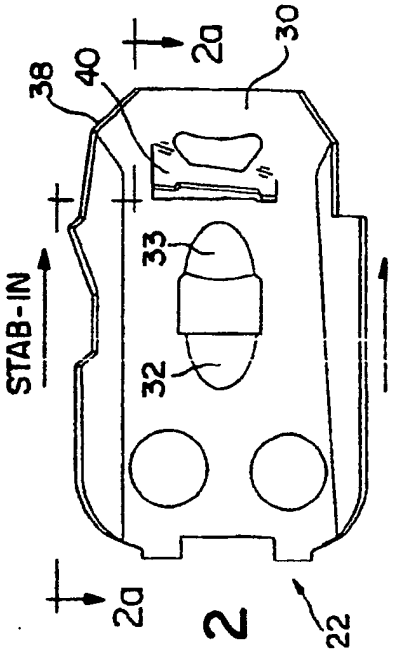
38
40
2a
30
STAB-IN
33
32
2a
22

FIG. 2

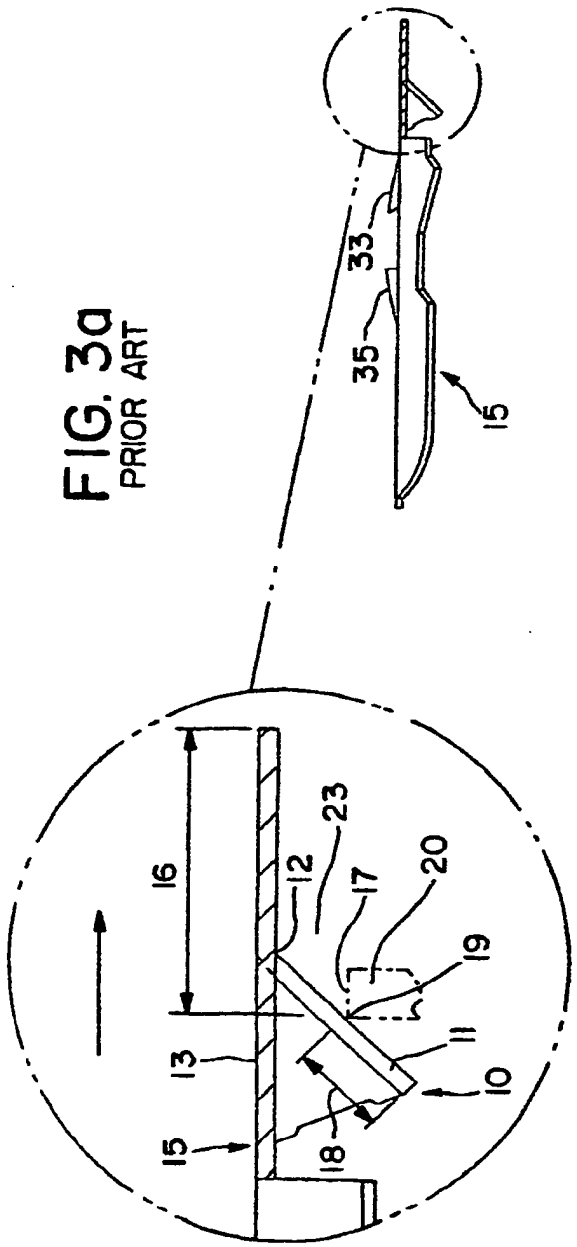

FIG. 3a
PRIOR ART

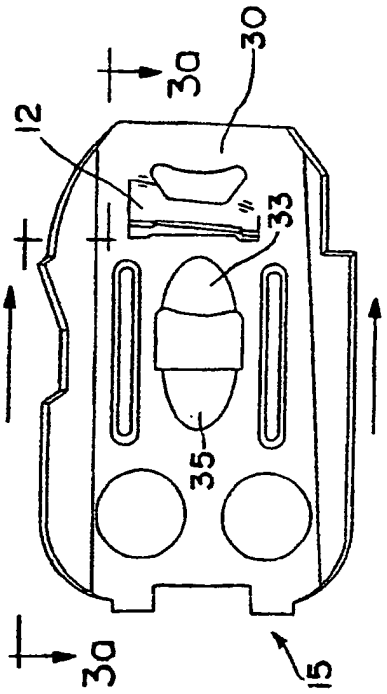

FIG. 3
PRIOR ART

FIG. 4

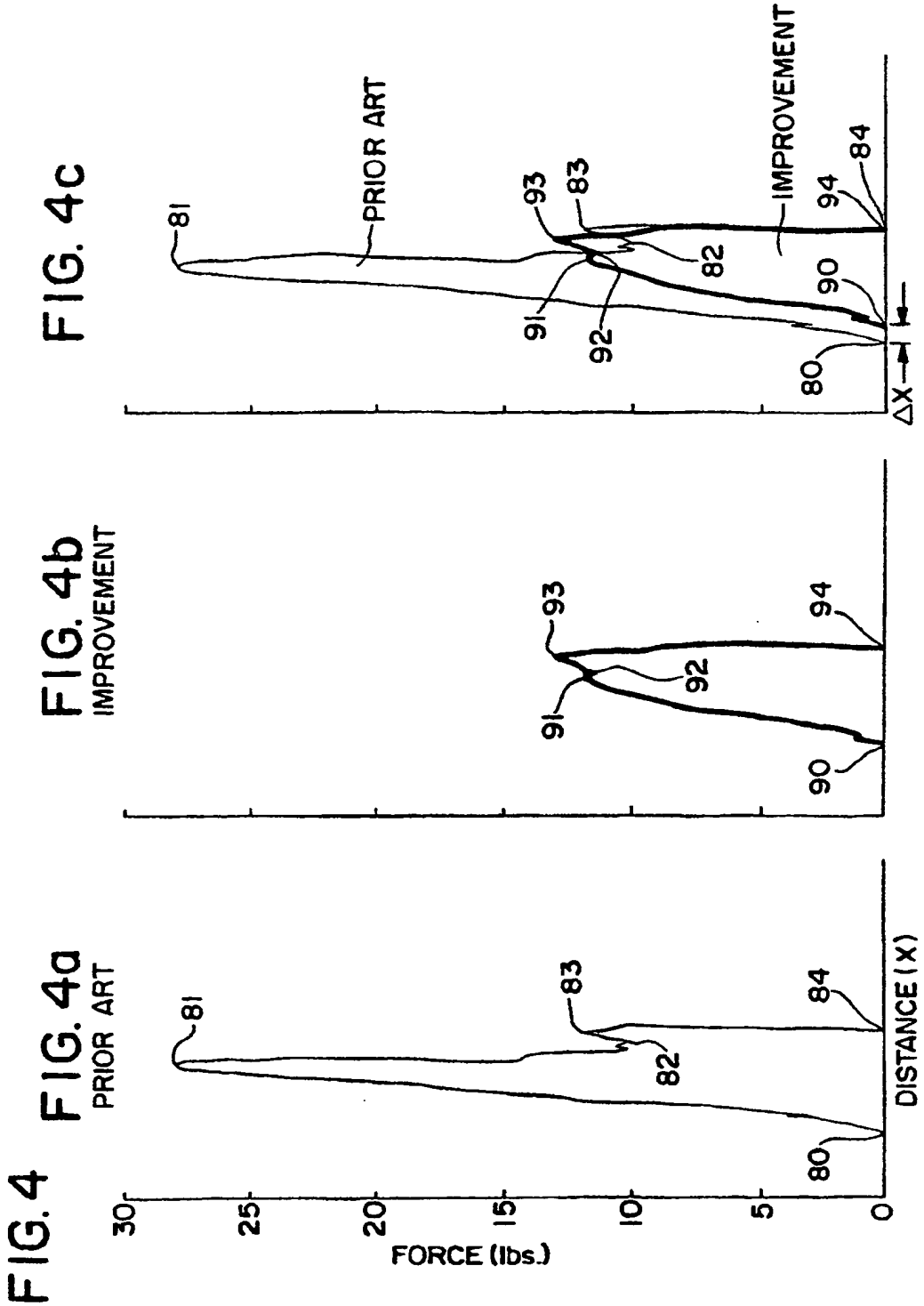
FIG. 4a
PRIOR ART
FIG. 4b
IMPROVEMENT
FIG. 4c
PRIOR ART
IMPROVEMENT
81
82
83
84
80
91
92
93
94
90
ΔX
30
25
20
15
10
5
0
FORCE (lbs.)
DISTANCE (X)

23

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5839246 A **[0003] [0012]**
- US 6178712 B **[0003]**
- US 4317641 A **[0012]**

24

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EINGEGANGEN
- 6. Juni 2005
v. FÜNER EBBINGHAUS FINCK HANO

Datum/Date: 01/06/05

Zeichen/Ref./Réf.	Anmeldung Nr./Application No./Demande n°./Patent Nr./Patent No./Brevet n°.
EPAD-86347.8	04026847.6-2303 / 1553239

Anmelder/Applicant/Demandeur/Patentinhaber/Proprietor/Titulaire
Worthington Armstrong Venture

NOTIFICATION OF EUROPEAN PUBLICATION NUMBER AND INFORMATION ON THE APPLICATION OF ARTICLE 67(3) EPC

You are hereby informed that the technical preparations for publication of the above-mentioned European patent application have been completed.

The application will be published on 13.07.05without the European search report.
The publication number is: 1553239
The publication will be mentioned in European Patent Bulletin number 2005/28
(http://www.european-patent-office.org/e-pub/bulletin/index.htm).

The provisional protection under Article 67(1)and (2) EPC in the individual contracting states becomes effective only when the conditions referred to in Article 67(3) EPC have been fulfilled. For further information, also with respect to extension states, please refer to the EPO brochure "National Law relating to the EPC" (http://www.european-patent-office.org/legal/national/index.htm).

The title of the invention in the three official languages of the European Patent Office is worded as follows:

Steckverbinder
Stab-in connector
Connecteur à fiche

In all future communications to the EPO, please quote the application number as indicated above, i.e. including the final four figures (which identify the Directorate responsible for the subsequent procedure).

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(54) Stab-in connector

(57) A stab-in connector (21) that locks with an opposing identical connector (22), through a slot (23) in the main beam (20) of a suspended ceiling grid. The connector has a cantilevered locking latch (40) that is pivoted in an arc from the base of the connector that delays contact with the side of the slot as the connector is being stabbed into the slot (23).

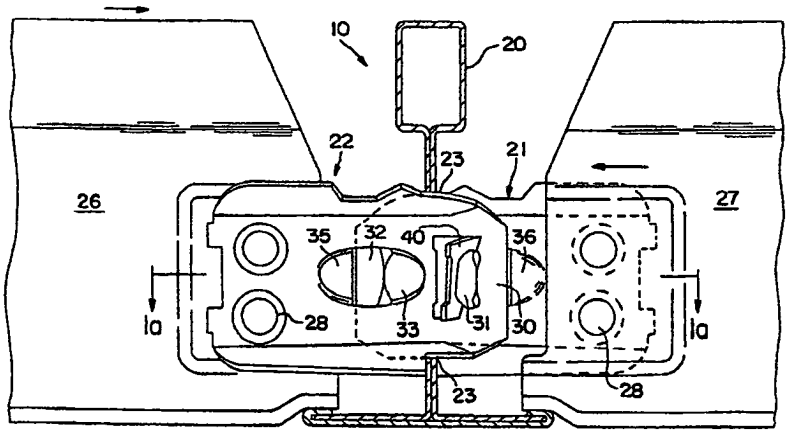

FIG. 1

EP 1 553 239 A2

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] Suspended ceilings are used extensively in commercial and industrial buildings. In such ceilings, a metal grid framework of interconnected main beams and cross beams is hung from a structural ceiling by wires. The grid supports acoustical panels in rectangular openings formed in the grid.

[0002] This invention relates to the connectors used in the grid to join a pair of opposing cross beams and a main beam at grid intersections.

Prior Art

[0003] Suspended ceilings having metal beams interconnected into a grid that supports panels are well known. U.S. Patents 5,839,246 and 6,178,712, for instance, incorporated herein by reference, show such ceilings.

[0004] The grid in such ceilings has, at each grid intersection, a pair of opposing cross beams and a main beam that form a connection.

[0005] The present invention relates to such a connection.

[0006] Each cross beam in such a connection has a connector at its end that is thrust, or stabbed-in, from opposing sides of the main beam, through a slot in the main beam. The connectors are all identical.

[0007] The connector that is first inserted into the slot is prevented from being withdrawn back out of the slot by the cantilevered latch in the connector, in the form of a pivoted flexible leaf spring. Such latch, which is integral with the connector base and formed therefrom by punching, is biased toward an open position. The latch, which is cantilevered at an angle from the base of the connector, flexes toward a closed position under the restraint of the side of the slot when the connector is stabbed through the slot to make the connection, but which then reflexes back to its biased rest position to prevent withdrawal of the connector back out of the slot.

[0008] Another connector on an opposing cross beam, identical to the first connector thrust through the slot, is then stabbed through the slot in the reduced space in the slot alongside the first. The latch on the connector contacts the side of the slot close to the latch pivot, and is flexed toward a closed position.

[0009] In inserting particularly the second connector into the slot, with a linear stab-in motion, substantial work and force are necessary to make the connection.

[0010] This resistance arises virtually immediately as the second connector into the slot enters the slot, and continues throughout the travel of the connector until it is seated in a locked position, as described below, with the first connector into the slot.

[0011] Both connectors interconnect when the second connector into the slot is fully inserted. Detents formed from the connector base, in the form of bulbs, that have a cam side and a locking side, and the ends of the connectors, flex and reflex to engage in what is sometimes referred to as a connector-to-connector lock, or "handshake" lock. Such a "handshake" connection between the connectors prevents the connectors from being pulled apart lineally out of the slot. The connectors are kept laterally and vertically together by the slot in the main beam.

[0012] In the seated locked position, the second connector is horizontally aligned with the first connector within the confines of the slot, so that the locking detents on the connectors are engaged and retained at the same level to form the connector-to-connector lock. Generally, the second connector must be either elevated or depressed as it passes into the slot to achieve such horizontal alignment. Hence, the profile of the leading edge of the connector is tapered to guide the connector during its travel through the main beam slot.

[0013] Such connectors are well known in the prior art and are disclosed, for instance, in the above referred to patents.

[0014] Numerous such connections must be made to create a ceiling grid.

SUMMARY OF THE PRESENT INVENTION

[0015] The prior art stab-in connector described above is improved so that it takes much less force, and less work, to make the connection.

[0016] There is less work and less force necessary, because, in inserting the second connector into the reduced area of the slot of the main beam, (1) there is a delay in the contact between the locking latch and the side of the slot, so that during the delay, (2) elements in the ensuing connection are positioned while offering the least resistance from frictional forces to such positioning, and (3) when contact between elements does occur, the elements are positioned to offer the least resistance to making a connection.

[0017] To achieve the above, the locking latch, which in its unflexed position, must extend laterally far enough out from the base of the connector to prevent withdrawal of the first connector through the slot before the second connector is inserted, is pivoted from the connector base in an arc, rather than in an acute bend as in the prior art.

[0018] This, as set forth in (1) above, delays contact between the latch and the side of the slot, when the second connector is inserted into the slot and, as set forth in (2) above, such contact is made further out along the latch from the pivot point, closer to the end of the latch, creating a longer lever arm, so that less force is needed to close the latch.

[0019] The outward end of the locking latch in an unflexed position, extends to the same position as the prior

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art straight latch pivoted at a sharp, acute angle. This position is necessary, so that the connector cannot be withdrawn after the latch passes through the slot.

[0020] Also, during the delay in (1) above, the second connector into the slot is being positioned vertically by the taper on the leading end of the connector, which engages either the top or bottom of the slot, to the same horizontal level as the first connector, without frictional resistance created in the connection of the prior art, where the locking latch, virtually immediately, forces the first and second connection laterally together.

[0021] By adjusting the second connector into the slot more quickly vertically as it travels through the slot, the second connector, when the locking detents and connector ends engage in there by flexing, are in a position, as set forth in (3) above to offer the least resistance to flexing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Figure 1 is a right side elevational of a connection of two cross beams through a slot in the main beam, showing the connectors of the invention engaged in a connector-to-connector lock.

Figure 2 is a right side elevational view of the connector of the invention, shown in the connection of Figure 1.

Figure 2a is a top sectional view of the connector of the invention, taken on the line A-A of Figure 2, with an enlarged circled portion showing the latch of the invention.

Figures 3 and 3a are views of a prior art corresponding to the views of Figures 2 and 2a.

Figure 3 is a side elevational view of a prior art connector.

Figure 3a is a top sectional view of a prior art connector taken on the line A-A of Figure 3, with an enlarged circled portion showing a prior art latch.

Figure 4 is a group of graphs, 4a, 4b, and 4c which represent the forces involved in making a connection.

Figure 4a is a graph of the force necessary to overcome resistance in making the connection of the prior art.

Figure 4b is a graph of the force necessary to overcome resistance in making the connection of the invention.

Figure 4c is a graph of the forces represented in 4a and 4b, overlapped.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The Prior Art

[0023] U.S. Patent 5,839,246, incorporated herein by reference, is representative of the prior art connection which is improved by this invention. The connection itself, and the method of making such connection, is set forth in detail in the '246 patent.

[0024] In the present drawings, a connection of the invention is shown in Figures 1, 1a, with the improvement of the invention shown more clearly in Figure 2 and 2a. In the present connection, main beam 20, shown in cross section, extends longitudinally in a ceiling grid. Identical connectors 21 and 22 have been stabbed through a slot 23 in the web 25 of the main beam 20 and interconnect. The connectors 21 and 22 are connected respectively to cross beams 26 and 27 by rivets at 28. In the connection, the following occurs:

(1) End 30 of connector 21 engages detent 31 to form a connector-to-connector connection, as does end 32 of connector 22 engage detent 33;

(2) Locking latches 40 on connector 21 and connector 22 are in an unflexed position;

(3) Backstops 35 and 36 on connectors 21 and 22 secure the ends 30 and 32 in the connector-to-connector lock;
and

(4) Connectors 21 and 22 are kept laterally and vertically constrained within slot 23 by the cross sectional configuration of the connectors, as well known in the art.

[0025] The general configuration so far described conforms to the prior art.

[0026] In making the connection shown in Figures 1 and 1 a, and in the cited patents, a first connector, either connector 21 or 22, both being identical, is thrust or stabbed through the slot 23 in the prior art manner. In this explanation, it will assume connector 21 is first thrust through the slot.

[0027] Locking latch 40 contacts side of slot 23 and is flexed enough to allow the latch 40 to pass through slot 23 and reflex back to a rest position, in a one way movement. In this position, the first connector 21 through the slot is retained within the slot 23.

[0028] The second connector 22 is then thrust through the slot 23 along side the first connector 21 through the slot 23. Again, locking latch 40 contacts side of slot 23, but now there is less room in the slot because a connector has already been inserted. The second con-

nector 22 into the slot, as it is thrust through the slot 23, flexes the latch 40 toward a closed position, until the latch passes through the slot after which it flexes open to a rest position. The connectors 21 and 22 also form a connector-to-connector lock at this point, as seen in Figure 1, wherein the detents 31 and 33 and the beam ends 30 and 32 have flexed and then reflexed into a locked position, at rest.

[0029] In these stab-in connections, as the second connector into the slot, for instance connector 22, travels through the slot 23 to a seated position, after the first connector 21 into the slot has been inserted, the following occurs:

(1) The second connector 22 is adjusted vertically within the slot 23.

(2) The second connector 22 is forced laterally by a side of the slot 23 against the first connector 21.

(3) The locking latch 40 on the second connector 22 is flexed toward a closed position by a side of the slot 23 until the latch 40 passes through the slot 23, and then it springs open to a rest position as seen for instance in Figure 1.

(4) The locking detents 31 and 33 and connector ends 30 and 32 on the first and second connectors 21 and 22 are flexed apart as they contact one another, and then reflexed into a locking position.

[0030] In the prior art, (1) through (4) above overlapped or occurred virtually simultaneously, so that the force and work required to complete a connection 10 was not only the sum of the forces necessary to overcome the sum of the individual resistances created by (1), (2), (3) and (4) referred to immediately above, but also the force and work to overcome the friction created when forces (1), (2), (3) and (4) overlapped, or occurred simultaneously. These frictional resistances included:

a. The friction between the latch 40 on the second connector 22 and the side of the slot 23 as the second connector 22 was being positioned vertically in the slot 23.

b. The friction laterally between the base of the connectors 21 and 22.

c. The friction between the top or bottom of the second connector 22 and the top or bottom of the slot 23 as the second connector 22 was being positioned vertically within the slot 23.

d. The friction between the detents 31 and 33 and ends 30 and 32 on the first connector 21 into the slot and second connector 22 into the slot 23 as the second connector 22 was being vertically positioned within the slot 23.

[0031] In the prior art, in an attempt to reduce the total force and work required, the taper 37 or slope on the leading edge of a prior art connector 15, as seen in Figure 3, was made at a gradual incline, so the frictional forces could be spread throughout the length of the insertion, as the second connector into the slot 23 was being adjusted vertically.

The Present Improvement

[0032] The present improvement reduces substantially the force necessary to overcome the resistance from the frictions (a), (b), (c) and (d) above and the forces necessary in (3) above to flex the locking latch 40 of the invention toward a closed position, and in (4) above to flex the detents 31 and 33 and ends 30 and 32 relative to one another to create the connector-to-connector interlock.

[0033] As in the prior art, in the present improvement the cantilevered leaf spring latch 40 continues to be formed, as by punching, from the connector base 39, as seen, for instance, in Figures 2 and 2a. The latch of the prior art, designated 10 as seen in Figures 3 and 3a, is in the form of a straight lever 11, pivoted at 12. It forms an acute sharp angle with the base 13 of prior art connector 15.

[0034] In the improvement of the invention, the latch of the invention 40, as seen in Figures 2 and 2a, herein, is formed from the base 41 with a radius 42, for instance .04 inches, before extending in straight lever fashion. The straight portion 43 of the latch of the invention 40 forms an angle of about 429 with the base 41. Such a curve in locking latch 40 increases the distance 46 the second connector 21 or 22, enters into the slot 23 before it contacts the side of the slot 23 at 47 to create a resistance from such latch of the invention 40 against the side of the slot 23. Such a curved locking latch of the invention 40 also reduces the distance 48 the latch of the invention 40 is in contact with the side of the slot 23 as it is being flexed toward a closed position as it passes through the slot 23, since it contacts the latch 40 closer to the end of the latch than does prior art straight latch 10.

[0035] Representative dimensions for the locking latch 40 of the invention are shown in Figure 2a.

[0036] Further, the first contact of the latch of the invention 40 with the side of the slot 23 is further out from the point 51 of the latch of the invention 40 where it is joined to on the base 41, since part of the curved part of the latch of the invention 40 extends in the plane of the base 41 and is not exposed to contact by the side of the slot 23. Point 51 is the cutting start and the bending start of the latch of the invention 40 as seen in Figure 2a.

[0037] Thus, the force exerted by the side of the slot

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23 as the latch of the invention 40 passes through the slot is applied further from the pivot point 51 than in the prior art, thus requiring less force to pivot the latch of the invention 40, than in the prior art straight lever latch 10, since the force has a greater lever arm in the latch of the invention 40 when it meets the side of slot 23 as it is thrust into the connection.

[0038] Thus, less force over a shorter distance is required to collapse the latch of the invention 40 than was required to collapse latch 10 in the prior art. This results in substantially less work that has to be done to make a connection. This beneficial effect in one connection, is multiplied by the many connections required in forming a ceiling grid for a suspended ceiling.

[0039] In the connection improved by the present invention, during the time the connector is being inserted, it is necessary to adjust the connector vertically, so that when fully inserted, the connector fits vertically into the slot 23 .

[0040] Since the force necessary to collapse the latch 10 of the prior art was substantial, and arose near the leading edge of the connector, the taper that guided the connector vertically to its fully seated position so that the connector was in place vertically when fully inserted, was gradual, to limit the added resistance at any one point in the insertion.

[0041] Thus, even when the connector-to-connector interlock was being created, wherein the detents were flexing, the connector was still being adjusted vertically, in view of such necessity to make the taper gradual rather than abrupt, thereby creating still more resistance.

[0042] In the present invention, the taper 38 at the leading edge of the connector 21, 22 is made relatively abrupt, at a steeper angle, so that a relative immediate adjustment is made vertically to the connector as it is being inserted into the slot 23. Even though a more steep, immediate adjustment would normally require a greater insertion force than that of a gradual insertion, there is less, rather than more force required. This reduction in force is obtained by the delayed contact of the locking latch of the invention 40 with the side of slot 23, since there is virtually no drag or resistance from the locking latch of the invention 40.

[0043] There is a further benefit that is achieved by early vertical positioning of the connector within the slot 23 during insertion. As the detents 31 and 33, and the ends 30 and 32 of the first and second connectors of the invention 20 and 21 come into contact, the detents and ends are at a position relative to one another, vertically, where there is least resistance to flexing of these elements laterally into the locking position. Whereas in the prior art, contact was made between detents and ends, and force was exerted between these elements, off-center from their most flexible position, the force required to flex the detents and ends, was again substantial.

[0044] Figures 3 and 3a show a prior art connector, while Figures 2 and 2a show a connector with the improvement of the invention.

[0045] As seen in Figures 3 and 3a, prior art latch 10 in the form of straight lever 11, is pivoted at an acute angle to base 13 of a prior art connector 15. Dotted line 17 represents, in the enlarged portion, the side of slot 23 as the connector 15 of the prior art is inserted into the slot 23. The prior art connector 15 travels the distance at 16 before it encounters the side of the slot at 19, which is at a distance 18 from the end of the prior art latch 10.

[0046] In Figures 2 and 2a, there is shown the connector of the invention 22, which is identical to the connector of the invention 21, with the latch of the invention 40. Again, as in Figure 3a, dotted line 17 in the enlarged portion, represents the side of slot 23 as the connector 22 is inserted into the slot 23. The connector 22 travels the distance 46 before it encounters the side of the slot 23 at 47. This is a distance 48 from the end of the latch of the invention 40.

[0047] The benefits of the present improvement over the prior art are shown graphically in Figures 4a, 4b and 4c.

[0048] Figure 4, including 4a, 4b, and 4c, shows the resistances encountered in a prior art connection compared to the forces encountered in a connection with the improved connector of the invention.

[0049] In the prior art, the line from 80 to 81 represents the resistance encountered during the initial insertion of the second connector into the slot, while the latch 10 is being flexed from its initial contact with the side of the slot 23, until the resistance reaches its highest at about 27 pounds at point 81.

[0050] The contact of the straight lever 11 of prior art latch 10 is relatively close to the pivot 12 during this travel. At 81, there is a drop off in resistance during travel to point 82 to about 10 pounds. The straight lever latch 10 of the prior art during this drop off, contacts the side of the slot 23 further out along its straight lever 11, as it travels through the slot 23, so less force is necessary, since the lever arm is longer than at the initial contact.

[0051] At 82 there is a rise again in resistance due to the flexing of the detents 31 and 33 and connector ends 30 and 32 while they are forming a connector-to-connector lock. The resistance rises to point 83 at which point the connector-to-connector lock is completed, and all elements have reflexed to a rest position with no further resistance or movement occurring.

[0052] The forces required to overcome the resistance encountered in making a connection with the improvement of the invention is shown graphically in Figure 4a. The same movement of the second connector 22 into the slot 23, having the latch of the invention 40, is shown, as was shown with the prior art connector, in Figure 4a. Initial contact with the side of the slot 23 occurs at 90 and rises to 91 where there is a resistance of about 14 pounds. There is a very slight drop off in resistance as the latch of the invention 40 passes through the slot. The resistance then rises to point 99 at about

33

16 pounds while the connector-to-connector lock is being formed as the detents 31 and 33 and connector ends 30 and 32 are flexing, after which there is a drop off at point 94, where all resistance ends after the connector-to-connector lock is formed.

[0053] The force necessary, and the distance over which the force must be applied, is obviously remarkably less, in making the connection, with the present improvement in the connector.

[0054] Figure 4c overlaps the charts of Figures 4a and 4b with the locked position of the prior art connection, and the connection of the invention as an overlapped common point along the horizontal axis at 96. ΔX in the chart represent the distance of the delay in contact between the prior art latch 15, and the latch of the invention 40, with the side 17 of the slot 23, as the second connector into the slot is being inserted. Again, Figure 4c, in chart form, represents the substantial reduction in force, and work necessary to make the present connection, over that to make the prior art connection.

Claims

1. In a connector that is stabbed through a slot in a main beam in a suspended ceiling grid to lock with an opposing identical connector already in the slot, and that has a cantilevered locking latch integral with and pivoted from a base in the connector;
   the improvement comprising pivoting the locking latch from the base in an arc.

stabbed through the slot, is substantially reduced from said lateral friction created without the delay.

7. The improvement of claim 1, wherein such improvement provides a delay in contact between the side of the slot and the locking latch, so that during the delay the connector being stabbed through the slot can be adjusted vertically to a position where it locks with the connector already in the slot.

8. In combination, the improvements set forth in claims 1 through 7 above.

9. A connector of claim 8 wherein substantially less force over a shorter distance is required with the improvements set forth in claim 8, to lock the connectors to each other and to the main beam, than is required without the improvements.

FIG. 1

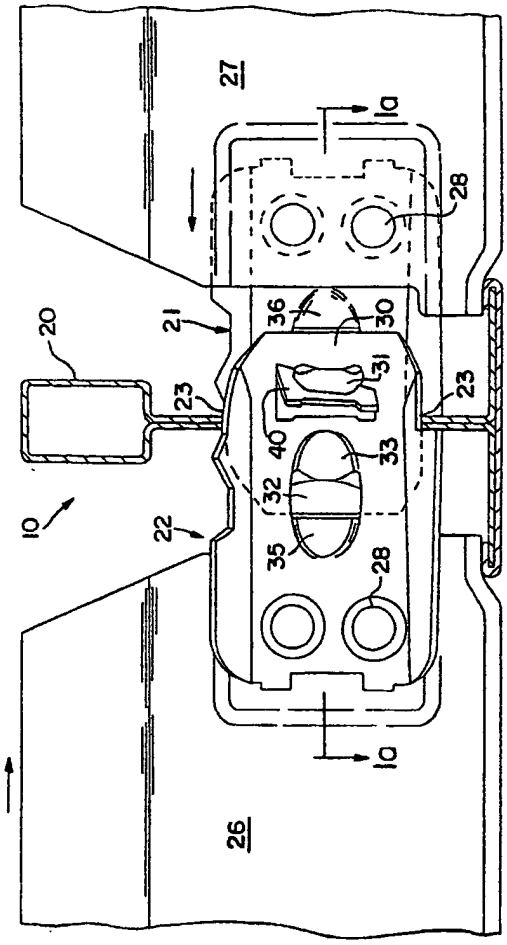
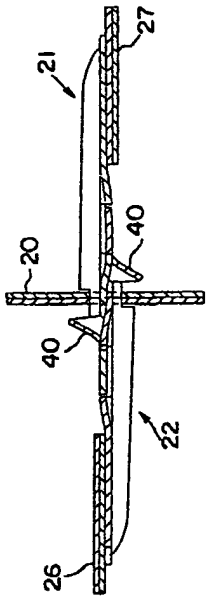


FIG. 1a



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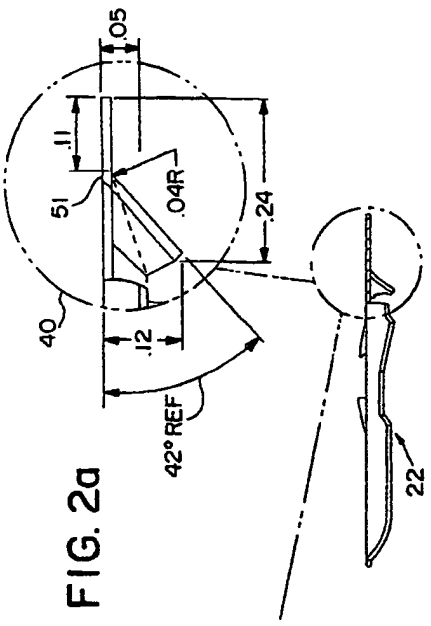
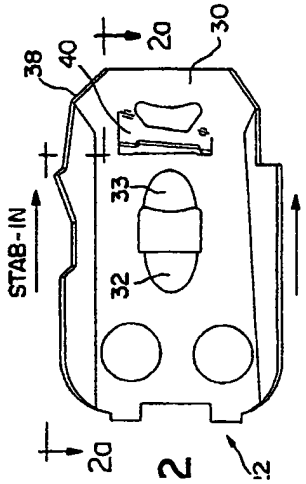


FIG. 2a



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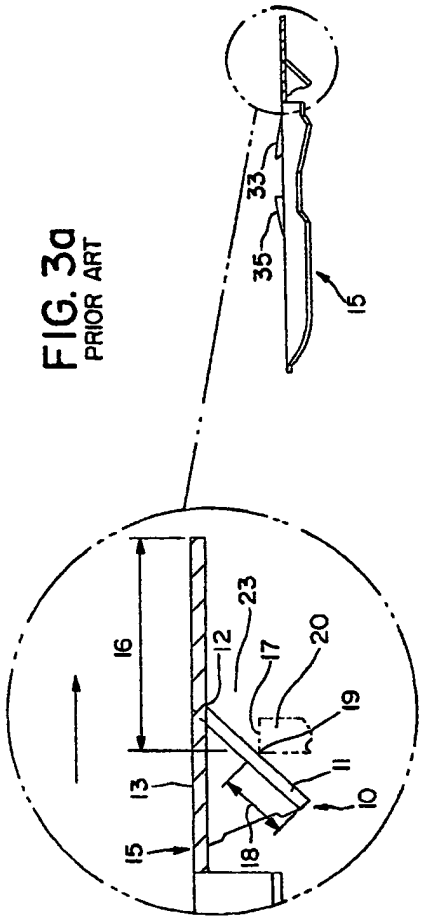

FIG. 3a
PRIOR ART

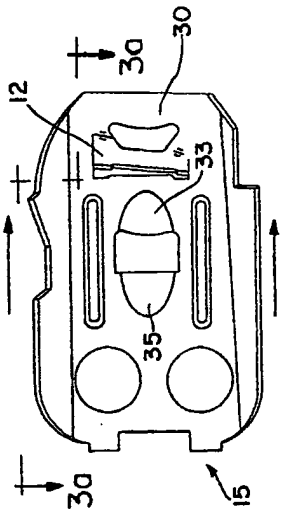

FIG. 3
PRIOR ART

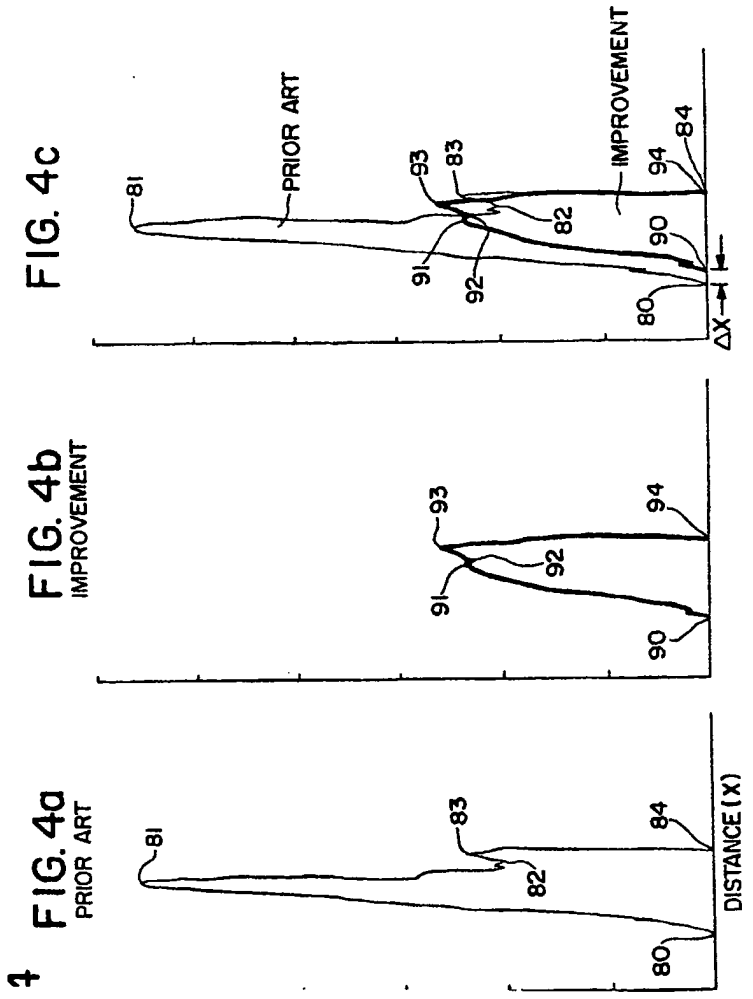
FIG. 4a
PRIOR ART
FIG. 4b
IMPROVEMENT
FIG. 4c
PRIOR ART
IMPROVEMENT
81
82
83
84
80
90
91
92
93
94
ΔX
DISTANCE (X)

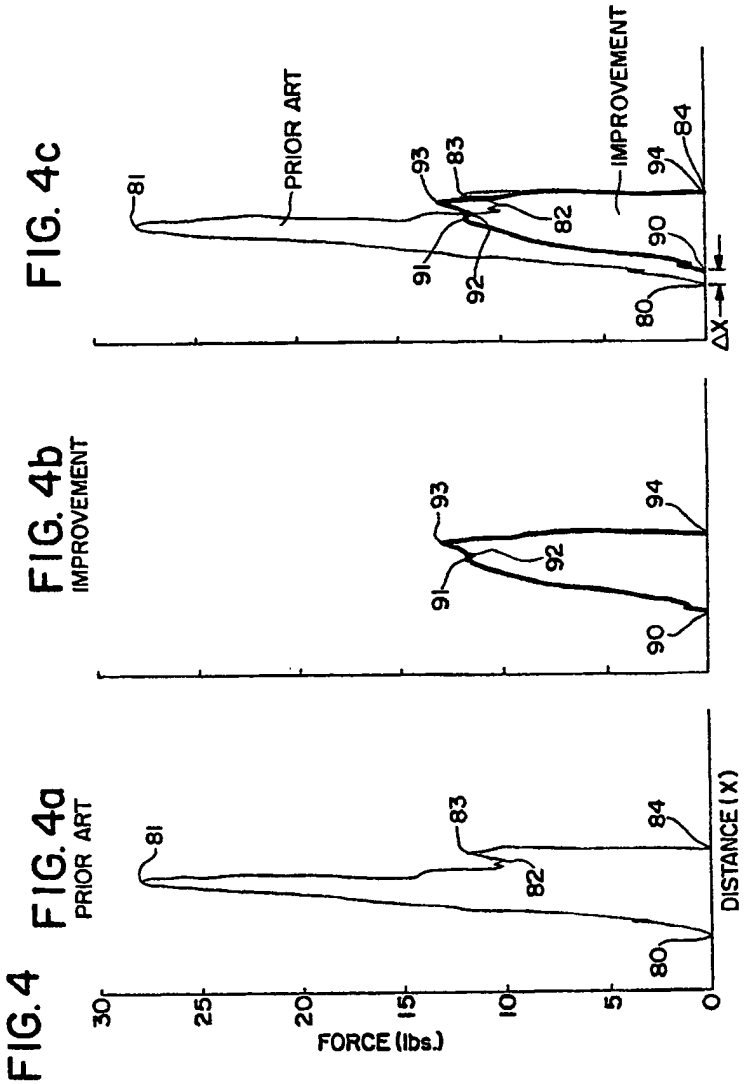
FIG. 4
FIG. 4a
PRIOR ART
FIG. 4b
IMPROVEMENT
FIG. 4c
PRIOR ART
IMPROVEMENT
81
82
83
84
80
90
91
92
93
94
30
25
20
15
10
5
0
FORCE (lbs.)
DISTANCE (X)
ΔX

(39)

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EINGEGANGEN
- 1. Juni 2006
v. FÜNER EBBINGHAUS FINCK HANO

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Date
31.05.06

Reference	Application No./Patent No.
EPAD-86347.8	04026847.6 - 2303

Applicant/Proprietor
Worthington Armstrong Venture

COMMUNICATION

The European Patent Office herewith transmits as an enclosure the European search report (under R. 44 or R. 45 EPC) for the above-mentioned European patent application.

If applicable, copies of the documents cited in the European search report are attached.

☐ Additional set(s) of copies of the documents cited in the European search report is (are) enclosed as well.

The following specifications given by the applicant have been approved by the Search Division :

☐ Abstract ☑ Title

☑ The abstract was modified by the Search Division and the definitive text is attached to this communication.

The following figure will be published together with the abstract : 1

Refund of search fee

If applicable under Article 10 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.

Europäisches Patentamt · European Patent Office · Office européen des brevets

4-1

European Patent Office

PARTIAL EUROPEAN SEARCH REPORT

which under Rule 45 of the European Patent Convention shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number EP 04 02 6847

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 839 246 A (ZIEGLER ET AL) 24 November 1998 (1998-11-24) * column 5, lines 11-19; figures 1-8,10,11 * ---	1,2	INV. E04B9/12
X	US 4 317 641 A (SAUER ET AL) 2 March 1982 (1982-03-02) * figures 1,3,5,6 * ---	1,2	
A	US 4 621 474 A (WORLEY ET AL) 11 November 1986 (1986-11-11) * figures 1,5,7 * ---	1,2	
A	US 4 108 563 A (BROWN ET AL) 22 August 1978 (1978-08-22) * figures 1,4,5 * ---	1,2	

TECHNICAL FIELDS SEARCHED (IPC)

E04B

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC to such an extent that a meaningful search into the state of the art cannot be carried out, or can only be carried out partially, for these claims.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
Munich	17 May 2006	Stern, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C07)

Claim(s) searched completely:
1,2

Claim(s) not searched:
3-9

Reason for the limitation of the search:

Claim 3 contains a reference to the drawings. According to Rule 29(6) EPC such a claim is allowable only where the reference is absolutely necessary (cf. EPO Guidelines, C-III, 4.10), which is not the case here.

Claims 4 to 7 and 9 do not meet the requirements of Article 84 EPC in that the matter for which protection is sought is not defined. The claims attempt to define the subject-matter in terms of the result to be achieved. Such a definition is only allowable under the conditions elaborated in the Guidelines C-III, 4.7. In this instance, however, such a formulation is not allowable because it appears possible to define the subject-matter in more concrete terms, viz. in terms of how the effect is to be achieved.

Claim 8 does only refer to technical features allegedly present in the previous claims and does not include any further technical features. Its inclusion in the set of claims does not comply with Article 84 EPC in that the set is therefore not concise.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 02 6847

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-05-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5839246 A	24-11-1998	CA 2234970 A1	19-03-1998
		CN 1207151 A	03-02-1999
		DE 69720406 D1	08-05-2003
		DE 69720406 T2	29-01-2004
		EP 0859892 A1	26-08-1998
		HK 1018295 A1	13-09-2002
		WO 9811309 A1	19-03-1998
US 4317641 A	02-03-1982	CA 1135927 A1	23-11-1982
US 4621474 A	11-11-1986	NONE	
US 4108563 A	22-08-1978	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

ABSTRACT / ZUSAMMENFASSUNG / ABREGE

04026847.6

A stab-in connector (21) that locks with an opposing identical connector (22), through a slot (23) in the main beam (20) of a suspended ceiling grid. The connector has a cantilevered locking latch (40) that is pivoted in an arc from the base of the connector that delays contact with the side of the slot as the connector is being stabbed into the slot (23).

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Application No.	Ref.	Date
04 026 847.6 - 2303	EPAD-86347.8	05.10.2006
Applicant: Worthington Armstrong Venture		

Communication pursuant to Article 96(2) EPC

The examination of the above-identified application has revealed that it does not meet the requirements of the European Patent Convention for the reasons enclosed herewith. If the deficiencies indicated are not rectified the application may be refused pursuant to Article 97(1) EPC.

You are invited to file your observations and insofar as the deficiencies are such as to be rectifiable, to correct the indicated deficiencies within a period

of 4 months

from the notification of this communication, this period being computed in accordance with Rules 78(2) and 83(2) and (4) EPC.

One set of amendments to the description, claims and drawings is to be filed within the said period on separate sheets (Rule 36(1) EPC).

Failure to comply with this invitation in due time will result in the application being deemed to be withdrawn (Article 96(3) EPC).

Europäisches Patentamt · European Patent Office · Office européen des brevets

Stern, Claudio
Primary Examiner
for the Examining Division

Enclosure(s): 3 page/s reasons (Form 2906)

The examination is being carried out on the **following application documents:**

Description, Pages 1-12 as originally filed
Claims, Numbers 1-9 as originally filed
Drawings, Sheets 1-4 as originally filed

1. The following documents are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

   D1: US-A-5 839 246
   D2: US-A-4 317 641

2. Clarity (Article 84 EPC):

2.1 Claim 1 is not clear in view of the use of the expression "In a connector ... the improvement comprising", as it is unclear whether protection is sought for the improvement only or for all the features defined in the claim (see EPO-Guidelines C-III, 4.8b).
The claims should be drafted in the two-part form, in accordance with Rule 29 (1) (a) and (b) EPC.

2.2 Claim 1 is further not clear in respect of its category (see EPO-Guidelines C III, 3.1 and 4.1), taking into account that it seems to be directed at a device but the improvement would seem to consist in a method step.

2.3 Claim 3 contains a reference to the drawings. According to Rule 29(6) EPC such a claim is allowable only where the reference is absolutely necessary (cf. EPO Guidelines, C-III, 4.10), which is not the case here.

2.4 Claims 4 to 7 and 9 do not meet the requirements of Article 84 EPC in that the matter for which protection is sought is not defined. The claims attempt to define the subject-matter in terms of the result to be achieved. Such a definition is only allowable under the conditions elaborated in the Guidelines C-III, 4.7. In this instance, however, such a formulation is not allowable because it appears possible to define the subject-matter in more concrete terms, viz. in terms of how the effect is to be achieved.

2.5 Claim 8 does only refer to technical features allegedly present in the previous claims and does not include any further technical features. Its inclusion in the set of claims does not comply with Article 84 EPC in that the set is therefore not concise.

2.6 In accordance with the EPO-Guidelines C-II, 4.18, either the relevant passages of documents US-A-5 839 246 and US-A-6 178 712, mentioned on page 1 of the description of the present application, should be incorporated into, or the reference to this document deleted from, the application.

3. Inasmuch as independent claim 1 can be understood at all, it would seem that the present application does not meet the requirements of Article 52(1) EPC, because the subject-matter of the said claim 1 is not new in the sense of Article 54(1) and (2) EPC.

3.1 Document D1 (the expressions in brackets refer to this document) discloses a connector (clip 40) that is stabbed through a slot (slot 30) in a main beam (main beam or runner 20) in a suspended ceiling grid to lock with an opposing identical connector (clip 40) already in the slot (30), and that has a cantilevered locking latch (ear 50) integral with and pivoted from a base in the connector (40), wherein the locking latch (ear 50) can be pivoted from the base in an arc (see column 5, lines 14-16).

3.2 Thus, the combination of features of independent claim 1 is entirely disclosed by the device described in D1.

3.3 It should be noted that the combination of features of claim 1 is also disclosed in document D2.

4. In the event of the continuation of the procedure, the Applicant is invited to take account of the following points:

4.1 it should be noted that, in accordance with Rule 86(4) EPC "amended claims may not

relate to **unsearched subject-matter** which does not combine with the originally claimed invention or group of inventions to form a single inventive concept" (see also EPO-Guidelines C-VI, 5.2 ii).

4.2 To meet the requirements of Rule 29 (1) EPC, the independent claims should be properly cast in the **two part form**, with those features which in combination are part of the prior art being placed in the preamble.

4.3 **Reference signs in parentheses** should be inserted in the claims to increase their intelligibility; this applies to both the preamble and characterising portion (Rule 29(7) EPC).

4.4 The description should be brought into conformity with the new claims to be filed; the definition of the **problem** underlying the invention should be presented in the description in such terms that its solution can be better understood in view of the disclosure of the corresponding closest prior art document (Rule 27 (1) (c) EPC). Care should be taken during revision, especially of the introductory portion including any statements of problem or advantage, not to add subject-matter which extends beyond the content of the application as originally filed (Article 123 (2) EPC).

4.5 The definition of the **problem** underlying the invention should be presented in the description in such terms that its solution can be better understood in view of the disclosure of the corresponding closest prior art document **(D1)** (Rule 27 (1) (c) EPC).

4.6 In order to expedite the procedure and to facilitate the examination of the conformity of the amended application with the requirements of Article 123(2) EPC, the applicant is requested to clearly identify all amendments carried out, irrespective of whether they concern amendments by addition, replacement or deletion, and to indicate on which passages of the original application each of these amendments are based (EPO-Guidelines E-II, 1).

v. FÜNER EBBINGHAUS FINCK HANO
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DIPL.-ING. CHRISTIAN HANO
DR. NICOLAI v. FÜNER
DR. SERGEJ SLOBOSHANIN
*bis 2002/until 2002

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November 30, 2006

04 026 847.6-2303
Worthington Armstrong Venture
Our file: EPAD-86347.8

In response to the communication of October 5, 2006.

New claims 1 to 4 are filed, on which the further examination procedure is to be based. The wording of new claim 1 has been amended by introducing features disclosed in the description of the invention (p.6, line 17 to p.7, line 3). Moreover, the wording of claim 1 has been redrafted in connection with the examiner's remarks mentioned in the communication and is presented in two-part form with respect to the general prior art solutions known from US 5 839 246 (D1) or US 4 317 641 (D2). In accordance with the examiner's remarks, the wording of claims 3 and 4 has been amended based on the description (two last lines on p. 8). Former claims 5 to 9 are deleted. Finally, all claims have been provided with reference signs according to Rule 29(7) EPC.

Further, amended description pages 1, 3 to 5, 8 and 10 to 12 are filed, which are to replace original pages 1, 3 to 5, 8 and 10 to 12. These description pages have also been adapted with respect to the examiner's remarks as well as with respect to the documents forming the state of the art of the present invention. The units used in the description have been brought into conformity with the requirements of Rule 35(12) EPC.

The title of the invention is amended as follows: "Locking connector".

Grant of a patent is requested for the amended claims 1 to 4, original description pages 2, 6 to 7 and 9, amended description pages 1, 3 to 5, 8 and 10 to 12 and original figures 1 to 4c.

Auxiliarily, oral proceedings are requested should the Examining division have any hesitations to grant a patent on the basis of the attached claims.

With respect to the patentability of the new claims the following argumentation is to be taken into account.

The object of the present invention is to provide a locking connector that takes much less force and less work to make a connection of a main beam and a pair of opposing cross beams of a suspended ceiling grid. This object is achieved by providing a locking connector in which a locking latch pivots from a base in an arc. The above-mentioned technical result is achieved due to a delay in contact between the side of a slot and a locking latch.

The object of D1 is to provide a suspended ceiling grid wherein reinforced cross members are allowed to expand, without collapsing or buckling, during a fire. This object is achieved by providing clips (locking connectors) at the end of the members, which create barriers that are successfully overcome, in stages, to relieve any excess longitudinal compressive forces. The technical result of D1 is to provide a suspended ceiling grid that keeps rectangular framework enclosures relatively intact during a fire.

The features shifted into the preamble of new claim 1 are known from D1.

However, from D1 it is not known that:

- the locking latch (of the locking connector) pivots from the base in an arc.

The applicant draws the examiner's attention to the fact that according to the specification of D1, assigned to the assignee of the present application, "cut-out 51 permits ear 50 to be bent at a suitable angle" (col.5, lines 14 to 16). The specification does not disclose any further explanation referring to pivoting of the ear 50. However, as can clearly be seen in the drawings (e.g. in Fig. 3, 8, 11 or 14), the ear 50 itself ("locking latch" in the present invention) is straight and,

therefore, does not pivot from the base of the locking connector in an arc. Fig. 8 shows unambiguously that the ear 50 is bent from the base in the form of an acute angle.

Thus, the claimed invention according to new claim 1 is new with respect to D1 according to Article 54 EPC.

Further, the object of D2 is to provide a locking connection for a supporting grid system (e.g. for a suspended ceiling grid) capable of withstanding severe tension loads tending to pull them apart, and to accommodate both horizontal and vertical relative angular movement of the interconnected cross tees without separation under such conditions of loading or under elevated temperature conditions. This object is achieved by providing a suspended ceiling grid including a first support member and a pair of second support members having a resiliently yieldable finger engageable through a slot in a web of the first support member for interlocking the first and second members. This provides a suspended ceiling grid with improved properties with respect to seismic disturbances or elevated temperature conditions caused by fire.

Some of the features placed in the preamble of new claim 1 are known from D2.

However, from D2 it is not known that:

- the locking latch pivots from the base in an arc.

The applicant points out that according to the wording of new claim 1 "when the locking connector is stabbed through the slot in the main beam , the locking latch is forced by a side of the slot to flex toward the base to permit the locking latch to pass through the slot, and when the locking connector has been stabbed through the slot , the locking latch flexes back to its relaxed position wherein it is pivoted away from the base". Based on this wording it can be established that the locking latch of the present invention is to be compared with a "resilient yieldable finger" 21 of D2 fulfilling the same function (s. D2, col.3, lines 7 to 8). However, as in D1 the resilient yieldable finger 21 of D2 is straight and does not pivot from the base in an arc.

The element 26 of D2 designed as a spring retainer is not a locking latch, straight or otherwise, and does not pass through a slot (s. e.g. Fig.4). The function of the element 26 is simply to capture and guide the forward edge of the opposing connector while a connection is made, and to

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keep the connectors against one another after the connection is made (s. D2, col.3, lines 39 to 49).

Thus, the invention according to new claim 1 is new with respect D2, too.

Further, neither D1 nor D2 disclose ideas which could be used by a person skilled in the art in order to come to the principles of the present invention. Thus, the invention according to new claim 1 is considered as involving an inventive step according to Art. 56 EPC with respect to D1 and D2.

Hence, the requests made above are well-founded.

D. Finck

Enclosures
- new claims 1 to 4
- amended description pages 1, 3 to 5, 8 and 10 to 12

AN/sk

CLAIMS

1. A locking connector (21, 22) for a suspended ceiling grid comprising a main beam (20) and cross beams (26, 27),
   - wherein the locking connector (21) is designed to be stabbed through a slot (23) in the main beam (20) to lock with an opposing identical locking connector (22) already in the slot (23) and has a cantilevered locking latch (40) being integral with and pivoted from a base (41) in the locking connector (21), and
   - wherein, when the locking connector (21, 22) is stabbed through the slot (23) in the main beam (20), the locking latch (40) is forced by a side of the slot (23) to flex toward the base (41) to permit the locking latch (40) to pass through the slot (23), and when the locking connector (21, 22) has been stabbed through the slot (23), the locking latch (40) flexes back to its relaxed position wherein it is pivoted away from the base (41),

   characterized in that the locking latch (40) pivots from the base (41) in an arc.

2. The locking connector according to claim 1, characterized in that the arc forms a radius of about 0.1 cm (0.04 inches).

3. The locking connector according to claim 1, characterized in that the locking latch (40) has a straight portion (43) which forms an angle of about 42° with the base (41).

4. The locking connector according to claim 1, characterized in that a delay in contact between the side of the slot (23) and the locking latch (40) is provided when the locking connector (21, 22) is stabbed through the slot (23).

locking connector [~~STAB-IN CONNECTOR~~]

BACKGROUND OF THE INVENTION

[~~Field of the Invention~~]

Suspended ceilings are used extensively in commercial and industrial buildings. In such ceilings, a metal grid framework of interconnected main beams and cross beams is hung from a structural ceiling by wires. The grid supports acoustical panels in rectangular openings formed in the grid.

This invention relates to [~~the~~] locking connectors used in the grid to join a pair of opposing cross beams and a main beam at grid intersections.

[~~Prior Art~~]

Suspended ceilings having metal beams interconnected into a grid that supports panels are well known (U.S. Patents 5,839,246 ~~and~~ or U.S. 6,178,712, for instance). [~~incorporated herein by reference, show such ceilings~~]

The grid in such ceilings has, at each grid intersection, a pair of opposing cross beams and a main beam that form a connection.

[~~The present invention relates to such a connection~~]

Each cross beam in such a connection has a connector at its end that is thrust, or stabbed-in, from opposing sides of the main beam, through a slot in the main beam. The connectors are all identical.

depressed as it passes into the slot to achieve such horizontal alignment. Hence, the profile of the leading edge of the connector is tapered to guide the connector during its travel through the main beam slot.

of the generic kind in U.S. 5,839,246 or U.S. 4,317,641.

Such connectors are ~~well known in the prior art and are~~ disclosed, for instance, ~~in the above referred to patents~~. This prior art refers to a locking connector for a suspended ceiling grid as described in the preamble of claim 1.

~~Numerous such connections must be made to create a ceiling grid.~~

SUMMARY OF THE PRESENT INVENTION

The object of the present invention is to provide a locking connector

~~The prior art stab-in connector described above is improved so~~ that ~~it~~ takes much less force, and less work, to make the connection.

There is less work and less force necessary, because, in inserting the second connector into the reduced area of the slot of the main beam, (1) there is a delay in the contact between the locking latch and the side of the slot, so that during the delay, (2) elements in the ensuing connection are positioned while offering the least resistance from frictional forces to such positioning, and (3) when contact between elements does occur, the elements are positioned to offer the least resistance to making a connection.

To achieve the above, the locking latch, which in its unflexed position, must extend laterally far enough out from the base of the connector to prevent withdrawal of the first connector through the slot before the second connector is inserted, is pivoted from the connector base in an arc, rather than in an acute bend as in the prior art.

This, as set forth in (1) above, delays contact between the latch and the side of the slot, when the second connector is inserted into the slot and, as set forth in (2) above, such contact is made further out along the latch from the pivot point, closer to the end of the latch, creating a longer lever arm, so that less force is needed to close the latch.

(58)

The outward end of the locking latch in an unflexed position, extends to the same position as the prior art straight latch pivoted at a sharp, acute angle. This position is necessary, so that the connector cannot be withdrawn after the latch passes through the slot.

Also, during the delay in (1) above, the second connector into the slot is being positioned vertically by the taper on the leading end of the connector, which engages either the top or bottom of the slot, to the same horizontal level as the first connector, without frictional resistance created in the connection of the prior art, where the locking latch, virtually immediately, forces the first and second connection laterally together.

By adjusting the second connector into the slot more quickly vertically as it travels through the slot[~~the second connector, when~~] the locking detents and connector ends engage[~~in there~~] by flexing, are in a position, as set forth in (3) above, to offer the least resistance to[~~flexing~~]

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a right side elevational of a connection of two cross beams through a slot in the main beam, showing the connectors of the invention engaged in a connector-to-connector lock.

Figure 2 is a right side elevational view of the connector of the invention, shown in the connection of Figure 1.

Figure 2a is a top sectional view of the connector of the invention, taken on the line A-A of Figure 2, with an enlarged circled portion showing the latch of the invention.

Figures 3 and 3a are views of a prior art corresponding to the views of Figures 2 and 2a.

Figure 3 is a side elevational view of a prior art connector.

Figure 3a is a top sectional view of a prior art connector taken on the line A-A of Figure 3, with an enlarged circled portion showing a prior art latch.

Figure 4 is a group of graphs, 4a, 4b, and 4c which represent the forces involved in making a connection.

Figure 4a is a graph of the force necessary to overcome resistance in making the connection of the prior art.

Figure 4b is a graph of the force necessary to overcome resistance in making the connection of the invention.

Figure 4c is a graph of the forces represented in 4a and 4b, overlapped.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The Prior Art

U.S. Patent 5,839,246, incorporated ~~herein~~ by reference, is representative of the prior art connection ~~which~~ is improved by this invention. The connection itself, ~~and the~~ method of making such connection, is set forth in detail in the '246 patent.

In the present drawings, a connection of the invention is shown in Figures 1, 1a, and ~~with the improvement of~~ the invention is shown more clearly in Figure 2 and 2a. In the present connection, main beam 20, shown in cross section, extends longitudinally in a ceiling grid. Identical connectors 21 and 22 have been stabbed through a slot 23 in the web 25 of the main beam 20 and interconnect. The connectors 21 and 22 are connected respectively to cross beams 26 and 27 by rivets at 28.

c. The friction between the top or bottom of the second connector 22 and the top or bottom of the slot 23 as the second connector 22 was being positioned vertically within the slot 23.

d. The friction between the detents 31 and 33 and ends 30 and 32 on the first connector 21 into the slot and second connector 22 into the slot 23 as the second connector 22 was being vertically positioned within the slot 23.

In the prior art, in an attempt to reduce the total force and work required, the taper 37 or slope on the leading edge of a prior art connector 15, as seen in Figure 3, was made at a gradual incline, so the frictional forces could be spread throughout the length of the insertion, as the second connector into the slot 23 was being adjusted vertically.

[~~The Present Improvement~~]

The present [~~improvement~~ invention] reduces substantially the force necessary to overcome the resistance from the frictions (a), (b), (c) and (d) above and the forces necessary in (3) above to flex the locking latch 40 of the invention toward a closed position, and in (4) above to flex the detents 31 and 33 and ends 30 and 32 relative to one another to create the connector-to-connector interlock.

As in the prior art, in the present [~~improvement~~ invention] the cantilevered leaf spring latch 40 continues to be formed, as by punching, from the connector base 39, as seen, for instance, in Figures 2 and 2a. The latch of the prior art, designated 10 as seen in Figures 3 and 3a, is in the form of a straight lever 11, pivoted at 12. It forms an acute sharp angle with the base 13 of prior art connector 15.

In the [~~improvement of the~~ present] invention, the latch of the invention 40, as seen in Figures 2 and 2a, herein, is formed from the base 41 with a radius 42, for instance 0,1 cm (0,04 inches), before extending in straight lever fashion. The straight portion 43 of the latch of the invention 40 forms an angle of about 429 with the base 41. Such a curve

(6)

Since the force necessary to collapse the latch 10 of the prior art was substantial, and arose near the leading edge of the connector, the taper that guided the connector vertically to its fully seated position so that the connector was in place vertically when fully inserted, was gradual, to limit the added resistance at any one point in the insertion.

Thus, even when the connector-to-connector interlock was being created, wherein the detents were flexing, the connector was still being adjusted vertically, in view of such necessity to make the taper gradual rather than abrupt, thereby creating still more resistance.

In the present invention, the taper 38 at the leading edge of the connector 21, 22 is made relatively abrupt, at a steeper angle, so that a relative immediate adjustment is made vertically to the connector as it is being inserted into the slot 23. Even though a more steep, immediate adjustment would normally require a greater insertion force than that of a gradual insertion, there is less, rather than more force required. This reduction in force is obtained by the delayed contact of the locking latch of the invention 40 with the side of slot 23, since there is virtually no drag or resistance from the locking latch of the invention 40.

There is a further benefit that is achieved by early vertical positioning of the connector within the slot 23 during insertion. As the detents 31 and 33, and the ends 30 and 32 of the first and second connectors of the invention 20 and 21 come into contact, the detents and ends are at a position relative to one another, vertically, where there is least resistance to flexing of these elements laterally into the locking position. Whereas in the prior art, contact was made between detents and ends, and force was exerted between these elements, off-center from their most flexible position, the force required to flex the detents and ends, was again substantial.

Figures 3 and 3a show a prior art connector, while Figures 2 and 2a show a Cocking connector ~~with the improvement~~ of the present invention.

As seen in Figures 3 and 3a, prior art latch 10 in the form of straight lever 11, is pivoted at an acute angle to base 13 of a prior art connector 15. Dotted line 17

(62)

represents, in the enlarged portion, the side of slot 23 as the connector 15 of the prior art is inserted into the slot 23. The prior art connector 15 travels the distance at 16 before it encounters the side of the slot at 19, which is at a distance 18 from the end of the prior art latch 10.

In Figures 2 and 2a, there is shown the connector of the invention 22, which is identical to the connector of the invention 21, with the latch of the invention 40. Again, as in Figure 3a, dotted line 17 in the enlarged portion, represents the side of slot 23 as the connector 22 is inserted into the slot 23. The connector 22 travels the distance 46 before it encounters the side of the slot 23 at 47. This is a distance 48 from the end of the latch of the invention 40.

The benefits of the present [~~improvement~~ invention] over the prior art are shown graphically in Figures 4a, 4b and 4c.

Figure 4, including 4a, 4b, and 4c, shows the resistances encountered in a prior art connection compared to the forces encountered in a connection with the improved connector of the invention.

In the prior art, the line from 80 to 81 represents the resistance encountered during the initial insertion of the second connector into the slot, while the latch 10 is being flexed from its initial contact with the side of the slot 23, until the resistance reaches its highest at about 27 pounds at point 81.

The contact of the straight lever 11 of prior art latch 10 is relatively close to the pivot 12 during this travel. At 81, there is a drop off in resistance during travel to point 82 to about 10 pounds. The straight lever latch 10 of the prior art during this drop off, contacts the side of the slot 23 further out along its straight lever 11, as it travels through the slot 23, so less force is necessary, since the lever arm is longer than at the initial contact.

At 82 there is a rise again in resistance due to the flexing of the detents 31 and 33 and connector ends 30 and 32 while they are forming a connector-to-connector lock. The resistance rises to point 83 at which point the connector-to-connector lock

is completed, and all elements have reflexed to a rest position with no further resistance or movement occurring.

The forces required to overcome the resistance encountered in making a connection with the improvement of the invention is shown graphically in Figure 4a. The same movement of the second connector 22 into the slot 23, having the latch of the invention 40, is shown, as was shown with the prior art connector, in Figure 4a. Initial contact with the side of the slot 23 occurs at 90 and rises to 91 where there is a resistance of about 14 pounds. There is a very slight drop off in resistance as the latch of the invention 40 passes through the slot. The resistance then rises to point 93 at about 16 pounds while the connector-to-connector lock is being formed as the detents 31 and 33 and connector ends 30 and 32 are flexing, after which there is a drop off at point 94, where all resistance ends after the connector-to-connector lock is formed.

The force necessary, and the distance over which the force must be applied, is obviously remarkably less, in making the connection, with [~~the present improvement~~] [~~in~~] the connector, locking of the present invention.

Figure 4c overlaps the charts of Figures 4a and 4b with the locked position of the prior art connection, and the connection of the invention as an overlapped common point along the horizontal axis at 96. ΔX in the chart represent the distance of the delay in contact between the prior art latch 15, and the latch of the invention 40, with the side 17 of the slot 23, as the second connector into the slot is being inserted. Again, Figure 4c, in chart form, represents the substantial reduction in force, and work necessary to make the present connection, over that to make the prior art connection.

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Application No.	Ref.	Date
04 026 847.6 - 2303	EPAD-86347.8	02.03.2007
Applicant: Worthington Armstrong Venture		

Communication pursuant to Article 96(2) EPC

The examination of the above-identified application has revealed that it does not meet the requirements of the European Patent Convention for the reasons enclosed herewith. If the deficiencies indicated are not rectified the application may be refused pursuant to Article 97(1) EPC.

You are invited to file your observations and insofar as the deficiencies are such as to be rectifiable, to correct the indicated deficiencies within a period

of 4 months

from the notification of this communication, this period being computed in accordance with Rules 78(2) and 83(2) and (4) EPC.

One set of amendments to the description, claims and drawings is to be filed within the said period on separate sheets (Rule 36(1) EPC).

Failure to comply with this invitation in due time will result in the application being deemed to be withdrawn (Article 96(3) EPC).

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Stern, Claudio
Primary Examiner
for the Examining Division

Enclosure(s): 3 page/s reasons (Form 2906)

The examination is being carried out on the **following application documents:**

Description, Pages	2, 6, 7, 9	as originally filed
	1, 3-5, 8, 10-12	received on 30.11.2006 with letter of 30.11.2006
Claims, Numbers	1-4	received on 30.11.2006 with letter of 30.11.2006
Drawings, Sheets	1-4	as originally filed

1. The following documents are referred to in this communication:

   D1: US-A-5 839 246
   D2: US-A-4 317 641

2. Clarity (Article 84 EPC):

2.1 According to the wording of claim 1, the invention consists in that "the locking latch pivots from the base in an arc".

2.2 This wording is however understood by the Examining Division as meaning that a pivoting movement from a departing position of the latch in the plane of the connector to its deployed position is made by the locking latch along an arc around the pivot point 51.

2.3 Apart from the fact that this interpretation implies a method step, whereby the category of the claim is unclear, the same situation also happens when "pivoting" the ear 50 disclosed in document D1 from a departing position to a deployed position as shown i.e. in figure 8 in this document, which therefore also describes an "arc". Thus, document D1 (as well as D2) would still take away the novelty of claim 1.

2.4 However, and considering the description on file, it is clear that what is being meant is that, in contrast to the ear disclosed in D1 (or D2), which has a straight form, the latch

of the connector being claimed has a curved portion **and** a straight portion.

2.5 It is therefore suggested to reword the characterizing portion of claim 1 along the lines of the following (see the originally filed description on page 8, three first lines of the last paragraph):

"characterized in that the locking latch (40) is formed from the base (41) of the connector (21, 22) with a curved portion before extending in straight lever fashion."

2.6 This combination of features does not seem to be known from, nor rendered obvious by, the available prior art.

2.7 However, in order to avoid further clarity problems taking into account that the cross beams do not form part of the invention, the preamble of claim 1 should be drafted in the following way (changes in bold or strike-out mode):

A locking connector (21, 22) for a suspended ceiling grid comprising a main beam (20) and cross beams (26, 27),
- wherein the locking connector (21) is designed to be stabbed through a slot (23) in the main beam (20) to lock with an opposing identical locking connector (22) already in the slot (23) and has a cantilevered locking latch (40) being integral with and pivoted from a base (41) in the locking connector (21),
and
- wherein, when the locking connector (21, 22) is stabbed through the slot (23) in the main beam (20), the locking latch (40) ~~is~~ **can be** forced by a side of the slot (23) to flex toward the base (41) to permit the locking latch (40) to pass through the slot (23), and when the locking connector (21, 22) has been stabbed through the slot (23), the locking latch (40) ~~flexes~~ **can flex** back to its relaxed position wherein it is pivoted away from the base (41).

2.8 It is also noted that the reference sign 43 does not seem to appear in the figures and should therefore be deleted from the description, unless it can be shown that it unambiguously corresponds to a given element disclosed in the figures (see Rule 32(2)(i) EPC).

2.9 Dependent claims 2 to 4 would also seem to be allowable with a revised independent

claim as indicated herein above.

3. In order to expedite the procedure and to facilitate the examination of the conformity of the amended application with the requirements of Article 123(2) EPC, the applicant is requested to clearly identify all amendments carried out, other than the ones suggested by the Examining Division, irrespective of whether they concern amendments by addition, replacement or deletion, and to indicate on which passages of the original application each of these amendments are based (EPO-Guidelines E-II, 1).

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v. FÜNER EBBINGHAUS FINCK HANO
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DR. NICOLAI v. FÜNER
DR. SERGEJ SLOBOSHANIN
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April 10, 2007

04 026 847.6-2303
Worthington Armstrong Venture
Our file: EPAD-86347.8

In reply to the communication of March 2, 2007.

New claims 1 to 4 are filed, on which the further examination procedure is to be based. The wording of claim 1 has been substantially amended in accordance with the Examiner's suggestion pointed out in the communication identified above. However, to avoid a repetition the feature "from the base (41) of the connector (21, 22)...." is not included in the characterizing part of the new claim 1, since this feature is already mentioned in the preamble of claim 1 as "... locking latch (40) being integral with and pivoted from a base (41) in the locking connector (21)....". Further, the wording of claim 2 has been brought into conformity with the amended wording of claim 1. A basis for these amendments can be found in the specification (see page 8, last paragraph).

Further, an amended description page 3 is filed, which has been adapted with respect to the modified wording of the characterizing part of claim 1. Also, an amended figure 2a is filed, in which the previously not presented reference sign 43 is shown. An unambiguous disclosure of this amendment can be found in the description of the invention (see last paragraph on page 8).

Grant of a patent is requested on the basis of new claims 1 to 4, original description pages 2, 6, 7 and 9, amended description pages 1, 4, 5, 8 and 10 to 12 as filed with our letter of November 30, 2006, new description page 3, original pages 1/4, 3/4 and 4/4 of the drawings and new page 2/4 of the drawings.

Auxiliarily, oral proceedings are requested should the Examining Division have any hesitations to grant a patent on the basis of the attached claims.

Editorial amendments can be discussed by phone.

D. Finck

Enclosures
- new claims 1 to 4
- amended description page 3
- amended page 2/4 of the drawings

AN/sk

CLAIMS

1. A locking connector (21, 22) for a suspended ceiling grid comprising a main beam (20) and cross beams (26, 27),
   - wherein the locking connector (21) is designed to be stabbed through a slot (23) in the main beam (20) to lock with an opposing identical locking connector (22) already in the slot (23) and has a cantilevered locking latch (40) being integral with and pivoted from a base (41) in the locking connector (21), and
   - wherein, when the locking connector (21, 22) is stabbed through the slot (23) in the main beam (20), the locking latch (40) can be forced by a side of the slot (23) to flex toward the base (41) to permit the locking latch (40) to pass through the slot (23), and when the locking connector (21, 22) has been stabbed through the slot (23), the locking latch (40) can flex back to its relaxed position wherein it is pivoted away from the base (41),

   characterized in that the locking latch (40) is formed with a curved portion before extending in straight lever fashion.

2. The locking connector according to claim 1, characterized in that the curved portion forms a radius of about 0.1 cm (0.04 inches).

3. The locking connector according to claim 1, characterized in that the locking latch (40) has a straight portion (43) which forms an angle of about 42° with the base (41).

4. The locking connector according to claim 1, characterized in that a delay in contact between the side of the slot (23) and the locking latch (40) is provided when the locking connector (21, 22) is stabbed through the slot (23).

depressed as it passes into the slot to achieve such horizontal alignment. Hence, the profile of the leading edge of the connector is tapered to guide the connector during its travel through the main beam slot.

of the generic kind in U.S. 5,839,246 or U.S. 4,317,641.

Such connectors are ~~well known in the prior art and are~~ disclosed, for instance, ~~in the above referred to patents~~ This prior art refers to a locking connector for a suspended ceiling grid as described in the preamble of claim 1.

~~Numerous such connections must be made to create a ceiling grid.~~

SUMMARY OF THE PRESENT INVENTION

The object of the present invention is to provide a locking connector

~~The prior art stab-in connector described above is improved so~~ that ~~it~~ takes much less force, and less work, to make the connection.

There is less work and less force necessary, because, in inserting the second connector into the reduced area of the slot of the main beam, (1) there is a delay in the contact between the locking latch and the side of the slot, so that during the delay, (2) elements in the ensuing connection are positioned while offering the least resistance from frictional forces to such positioning, and (3) when contact between elements does occur, the elements are positioned to offer the least resistance to making a connection.

To achieve the above, the locking latch, which in its unflexed position, must extend laterally far enough out from the base of the connector to prevent withdrawal of the first connector through the slot before the second connector is inserted, ~~is pivoted from the connector base in an arc, rather than in an acute bend as in the prior art.~~ is formed with a curved portion before extending in straight lever fashion.

This, as set forth in (1) above, delays contact between the latch and the side of the slot, when the second connector is inserted into the slot and, as set forth in (2) above, such contact is made further out along the latch from the pivot point, closer to the end of the latch, creating a longer lever arm, so that less force is needed to close the latch.

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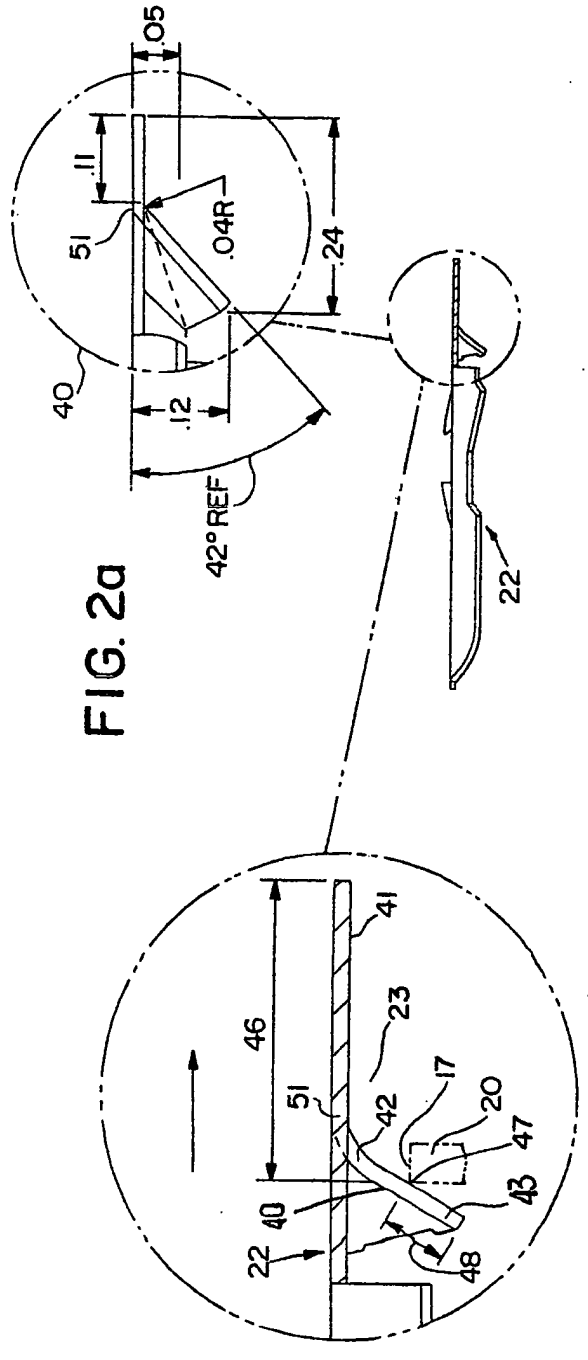
.05
.11
51
.04R
.24
40
.12
42° REF
22
41
46
23
51
17
42
20
47
43
40
22
48

FIG. 2a

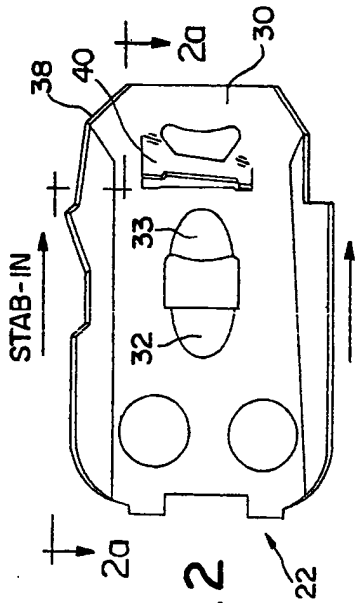
38
40
2a
30
33
STAB-IN
32
2a
22

FIG. 2

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Application No.	Ref.	Date
04 026 847.6 - 2303	EPAD-86347.8	24.04.2008
Applicant: Worthington Armstrong Venture		

Communication under Rule 71(3) EPC

You are informed that the Examining Division intends to grant a European patent on the basis of the above application with the text and drawings as indicated below:

In the text for the Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LU MC NL PL PT RO SE SI SK TR

Description, Pages

2, 6, 7, 9	as originally filed
1, 4, 5, 8, 10-12	received on 30.11.2006 with letter of 30.11.2006
3	received on 10.04.2007 with letter of 10.04.2007

Claims, Numbers

1-4	received on 10.04.2007 with letter of 10.04.2007

Drawings, Sheets

1, 3, 4	as originally filed
2	received on 10.04.2007 with letter of 10.04.2007

A copy of the relevant documents is enclosed

The title of the invention in the three official languages of the European Patent Office, the international patent classification, the designated Contracting States, the registered name of the applicant and the bibliographic data are shown on the attached EPO Form 2056.

You are requested within a non-extendable period of **four months** of notification of this communication

1. to file 1 set of translations of the claim(s) in the two other EPO official languages;

		EUR
2a. to pay the fee for grant including the fee for printing up to and including 35 pages;	Reference 007	790.00
2b. to pay the printing fee for the 36th and each subsequent page; number of pages: 0	Reference 008	0.00
3. to pay the additional claim fee(s) (R. 71(6) EPC); number of claims fees payable:	Reference 016	0.00
	Total amount	790.00

The mention of the grant of the patent shall be published in the European Patent Bulletin as soon as possible after the requirements concerning the translation of the claims and the payment of the fees for grant and printing, claims fees, designation fees and renewal fees as laid down in Rule 71(3), (4), (6) and (8) and (9) EPC are fulfilled.

Any divisional applications relating to this European patent application must be filed directly at the European Patent Office in Munich, The Hague or Berlin in accordance with Article 76(1) and Rule 36 EPC **before** the date on which the European Patent Bulletin mentions the grant of the patent (see Art. 97(3) EPC and OJ EPO 2/2002, 112).

If you do not approve the text intended for grant but wish to request amendments or corrections, the procedure described in Rule 71(4) EPC is to be followed.

If this communication is based upon an auxiliary request, and you reply within the time limit set that you maintain the main or a higher ranking request which is not allowable, the application will be refused (Art. 97(2) EPC).

If the enclosed claims contain amendments proposed by the Examining Division, and you reply within the time limit set that you cannot accept these amendments, refusal of the application under Article 97(2) EPC will result if agreement cannot be reached on the text for grant.

In all cases except those of the previous two paragraphs, if the fees for grant and printing or claims fees are not paid, or the translations are not filed, in due time, the European patent application will be deemed to be withdrawn (R. 71(7) EPC).

For all payments you are requested to use EPO Form 1010 or EPO Form 1010E or to refer to the relevant reference number.

After publication, the European patent specification can be downloaded free of charge from the EPO publication server https://publications.european-patent-office.org (OJ EPO 2005, 126).

Upon request in writing each proprietor will receive the certificate for the European patent **together with one copy** of the patent specification provided that the request is filed within the time limit of Rule 71(3) EPC. If such request has been previously filed, it has to be confirmed within the time limit of Rule 71(3) EPC. The requested copy is free of charge. If the request is filed after expiry of the Rule 71(3) EPC time limit, the certificate will be delivered without a copy of the patent specification.

Note on payment of renewal fees

If a renewal fee falls due between notification of the present communication and the proposed date of publication of the mention of the grant of the European patent, publication will be effected only after the renewal fee and any additional fee have been paid (R. 71(9) EPC).

Under Article 86(2) EPC, the obligation to pay renewal fees to the European Patent Office terminates with the payment of the renewal fee due in respect of the year in which the mention of the grant of the European patent is published.

Filing of translations in the Contracting States

Pursuant to Article 65(1) EPC the following Contracting States require a translation of the specification of the European patent in their/one of their official language(s) (R. 71(10) EPC), if this specification is not published in their/one of their official language(s)

- within **three months** of the publication of the mention of the gra

AT	AUSTRIA		REECE
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CH	SWITZERLAND / LIECHT		TALY
CY	CYPRUS		NETHERLANDS
CZ	CZECH REPU	PL	POLAND
DE	GERMAN	PT	PORTUGAL
DK	DEN	RO	ROMANIA
EE		SE	SWEDEN
ES		SI	SLOVENIA *
		SK	SLOVAKIA
		TR	TURKEY

KINGDOM

* requir y a translation of the claims

- within **six months** of publication of the mention of the grant:

IE IRELAND

The date on which the mention of the grant of the European patent will be published in the European Patent Bulletin will be indicated in the decision to grant the European patent (EPO Form 2006A).

The translation must be filed with the national Patent Offices of the Contracting or Extension States in accordance with the provisions applying thereto in the State concerned. Further details (e.g. appointment of a national representative or indication of an address for service within the country) are given in the EPO information brochure "National law relating to the EPC" and in the supplementary information updates published in the Official Journal of the EPO, or are available on the EPO website.

Failure to supply such translation to the Contracting or Extension States in time and in accordance with the aforementioned requirements may result in the patent being deemed to be void ab initio in the State concerned.

Important note to users of the automatic debiting procedure

The fees for grant and printing and also any additional claims fees due under Rule 71(6) EPC will be debited automatically on the date of filing of the translation of the (relevant) claims, or on the last day of the period of this communication. However, if the designation fees become due as set out in Rule 71(8) EPC and/or a renewal fee becomes due as set out in Rule 71(9) EPC, these should be paid separately by another permitted means of payment in order not to delay the publication of the mention of grant. The same applies in these circumstances to the payment of extension fees. For further details see the Arrangements for the automatic debiting procedure (AAD) and accompanying Information from the EPO concerning the automatic debiting procedure (Annexes A.1 and A.2 to the Arrangements for deposit accounts (ADA) in Supplement to OJ EPO 10/2007).

Examining Division:

Chairman:	Cleuziou, Yves
2nd Examiner:	Rosborough, John
1st Examiner:	Stern, Claudio

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Leroy, Valérie
For the Examining Division
Tel. No.: +49 89 2399 - 7466

Enclosure(s): Form 2056
17 Copies of the relevant documents

+++ ATTENTION +++

New amounts of procedural fees as from 01.04.2008 (see OJ EPO 1/2008)!

If additional claims fees (R. 71(6) EPC)* are to be paid and payment is received on or after 01.04.2008, claims fees are only payable from the sixteenth claim onwards. New amount to be paid: EUR 200,- per additional claim.
* to be amended

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Annex to EPO Form 2004, Communication pursuant to Rule 71(3) EPC

Bibliographical data of European patent application No. 04 026 847.6

For the intended grant of the European patent, the bibliographical data are set out below, for information:

Title of invention:	- Steckverbinder - Stab-in connector - Connecteur à fiche
Classification:	INV. E04B9/12
Date of filing:	11.11.2004
Priority claimed:	US / 09.01.2004 / USA754323
Contracting States* for which fees have been paid:	AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LU MC NL PL PT RO SE SI SK TR
Extension States* for which fees have been paid:	
Applicant(s):**	Worthington Armstrong Venture Suite 200, 9 Old Lincoln Highway Malvern, PA 19355 US
Inventor(s):	Sareyka, Brett W. 1100 West Chester Pike Apt. H-13 West Chester PA 19382 US Lin, Yu 304 Dunwoody Drive Blue Bell PA 19422 US Platt, William J. 3000 Franciscan Way Aston PA 19014 US

81

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*) If the time limit for the paymant of designation fees according to Rule 39(1) EPC has not yet expired and the applicant has not withdrawn any designation, **all Contracting States/Extension States** are currently still deemed to be designated. See also Rule 71(8) EPC and, if applicable, the above Note to users of the automatic debiting procedure.

**) If two or more applicants have designated different Contracting States, this is indicated here.

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Worthington Armstrong Venture ~~EPAD-86347.8~~

~~Locking connector~~
[~~STAB-IN CONNECTOR~~] **Druckexemplar**

BACKGROUND OF THE INVENTION

[~~Field of the Invention~~]

Suspended ceilings are used extensively in commercial and industrial buildings. In such ceilings, a metal grid framework of interconnected main beams and cross beams is hung from a structural ceiling by wires. The grid supports acoustical panels in rectangular openings formed in the grid.

This invention relates to [~~the~~] *Locking* connectors used in the grid to join a pair of opposing cross beams and a main beam at grid intersections.

[~~Prior Art~~]

Suspended ceilings having metal beams interconnected into a grid that supports panels are well known (U.S. Patents 5,839,246 ~~and~~ *or U.S.* 6,178,712, for instance). [~~incorporated herein by reference, show such ceilings~~]

The grid in such ceilings has, at each grid intersection, a pair of opposing cross beams and a main beam that form a connection.

[~~The present invention relates to such a connection~~]

Each cross beam in such a connection has a connector at its end that is thrust, or stabbed-in, from opposing sides of the main beam, through a slot in the main beam. The connectors are all identical.

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The connector that is first inserted into the slot is prevented from being withdrawn back out of the slot by the cantilevered latch in the connector, in the form of a pivoted flexible leaf spring. Such latch, which is integral with the connector base and formed therefrom by punching, is biased toward an open position. The latch, which is cantilevered at an angle from the base of the connector, flexes toward a closed position under the restraint of the side of the slot when the connector is stabbed through the slot to make the connection, but which then reflexes back to its biased rest position to prevent withdrawal of the connector back out of the slot.

Another connector on an opposing cross beam, identical to the first connector thrust through the slot, is then stabbed through the slot in the reduced space in the slot alongside the first. The latch on the connector contacts the side of the slot close to the latch pivot, and is flexed toward a closed position.

In inserting particularly the second connector into the slot, with a linear stab-in motion, substantial work and force are necessary to make the connection.

This resistance arises virtually immediately as the second connector into the slot enters the slot, and continues throughout the travel of the connector until it is seated in a locked position, as described below, with the first connector into the slot.

Both connectors interconnect when the second connector into the slot is fully inserted. Detents formed from the connector base, in the form of bulbs, that have a cam side and a locking side, and the ends of the connectors, flex and reflex to engage in what is sometimes referred to as a connector-to-connector lock, or "handshake" lock. Such a "handshake" connection between the connectors prevents the connectors from being pulled apart lineally out of the slot. The connectors are kept laterally and vertically together by the slot in the main beam.

In the seated locked position, the second connector is horizontally aligned with the first connector within the confines of the slot, so that the locking detents on the connectors are engaged and retained at the same level to form the connector-to-connector lock. Generally, the second connector must be either elevated or

(84)

depressed as it passes into the slot to achieve such horizontal alignment. Hence, the profile of the leading edge of the connector is tapered to guide the connector during its travel through the main beam slot.

of the generic kind in U.S. 5,839,246 or U.S. 4,317,641.

Such connectors are ~~well known in the prior art and are~~ disclosed, for instance, ~~in the above referred to patents~~. This part art refers to a locking connector for a suspended ceiling grid as described in the preamble of claim 1.

~~Numerous such connections must be made to create a ceiling grid.~~

SUMMARY OF THE PRESENT INVENTION

The object of the present invention is to provide a locking connector

~~The prior art stab in connector described above is improved so~~ that it takes much less force, and less work, to make the connection.

There is less work and less force necessary, because, in inserting the second connector into the reduced area of the slot of the main beam, (1) there is a delay in the contact between the locking latch and the side of the slot, so that during the delay, (2) elements in the ensuing connection are positioned while offering the least resistance from frictional forces to such positioning, and (3) when contact between elements does occur, the elements are positioned to offer the least resistance to making a connection.

To achieve the above, the locking latch, which in its unflexed position, must extend laterally far enough out from the base of the connector to prevent withdrawal of the first connector through the slot before the second connector is inserted, ~~is pivoted from the connector base in an arc, rather than in an acute bend as in the prior art.~~ is formed with a curved portion before extending in straight linear fashion.

This, as set forth in (1) above, delays contact between the latch and the side of the slot, when the second connector is inserted into the slot and, as set forth in (2) above, such contact is made further out along the latch from the pivot point, closer to the end of the latch, creating a longer lever arm, so that less force is needed to close the latch.

(85)

The outward end of the locking latch in an unflexed position, extends to the same position as the prior art straight latch pivoted at a sharp, acute angle. This position is necessary, so that the connector cannot be withdrawn after the latch passes through the slot.

Also, during the delay in (1) above, the second connector into the slot is being positioned vertically by the taper on the leading end of the connector, which engages either the top or bottom of the slot, to the same horizontal level as the first connector, without frictional resistance created in the connection of the prior art, where the locking latch, virtually immediately, forces the first and second connection laterally together.

By adjusting the second connector into the slot more quickly vertically as it travels through the slot[~~, the second connector, when~~] the locking detents and connector ends[~~'~~] engage[~~in there~~] by flexing, are in a position, as set forth in (3) above, to offer the least resistance to[~~flexing~~].

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a right side elevational of a connection of two cross beams through a slot in the main beam, showing the connectors of the invention engaged in a connector-to-connector lock.

Figure 2 is a right side elevational view of the connector of the invention, shown in the connection of Figure 1.

Figure 2a is a top sectional view of the connector of the invention, taken on the line A-A of Figure 2, with an enlarged circled portion showing the latch of the invention.

Figures 3 and 3a are views of a prior art corresponding to the views of Figures 2 and 2a.

Figure 3 is a side elevational view of a prior art connector.

Figure 3a is a top sectional view of a prior art connector taken on the line A-A of Figure 3, with an enlarged circled portion showing a prior art latch.

Figure 4 is a group of graphs, 4a, 4b, and 4c which represent the forces involved in making a connection.

Figure 4a is a graph of the force necessary to overcome resistance in making the connection of the prior art.

Figure 4b is a graph of the force necessary to overcome resistance in making the connection of the invention.

Figure 4c is a graph of the forces represented in 4a and 4b, overlapped.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The Prior Art

U.S. Patent 5,839,246, incorporated herein by reference, is representative of the prior art connection which is improved by this invention. The connection itself, and the method of making such connection, is set forth in detail in the '246 patent.

In the present drawings, a connection of the invention is shown in Figures 1, 1a, and 2 with the improvement of the invention is shown more clearly in Figure 2 and 2a. In the present connection, main beam 20, shown in cross section, extends longitudinally in a ceiling grid. Identical connectors 21 and 22 have been stabbed through a slot 23 in the web 25 of the main beam 20 and interconnect. The connectors 21 and 22 are connected respectively to cross beams 26 and 27 by rivets at 28.

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In the connection, the following occurs:

(1) End 30 of connector 21 engages detent 31 to form a connector-to-connector connection, as does end 32 of connector 22 engage detent 33;

(2) Locking latches 40 on connector 21 and connector 22 are in an unflexed position;

(3) Backstops 35 and 36 on connectors 21 and 22 secure the ends 30 and 32 in the connector-to-connector lock;

and

(4) Connectors 21 and 22 are kept laterally and vertically constrained within slot 23 by the cross sectional configuration of the connectors, as well known in the art.

The general configuration so far described conforms to the prior art.

In making the connection shown in Figures 1 and 1a, and in the cited patents, a first connector, either connector 21 or 22, both being identical, is thrust or stabbed through the slot 23 in the prior art manner. In this explanation, it will assume connector 21 is first thrust through the slot.

Locking latch 40 contacts side of slot 23 and is flexed enough to allow the latch 40 to pass through slot 23 and reflex back to a rest position, in a one way movement. In this position, the first connector 21 through the slot is retained within the slot 23.

The second connector 22 is then thrust through the slot 23 along side the first connector 21 through the slot 23. Again, locking latch 40 contacts side of slot 23, but now there is less room in the slot because a connector has already been inserted. The second connector 22 into the slot, as it is thrust through the slot 23, flexes the latch 40 toward a closed position, until the latch passes through the slot after which it flexes open to a rest position. The connectors 21 and 22 also form a connector-to-

connector lock at this point, as seen in Figure 1, wherein the detents 31 and 33 and the beam ends 30 and 32 have flexed and then reflexed into a locked position, at rest.

In these stab-in connections, as the second connector into the slot, for instance connector 22, travels through the slot 23 to a seated position, after the first connector 21 into the slot has been inserted, the following occurs:

(1) The second connector 22 is adjusted vertically within the slot 23.

(2) The second connector 22 is forced laterally by a side of the slot 23 against the first connector 21.

(3) The locking latch 40 on the second connector 22 is flexed toward a closed position by a side of the slot 23 until the latch 40 passes through the slot 23, and then it springs open to a rest position as seen for instance in Figure 1.

(4) The locking detents 31 and 33 and connector ends 30 and 32 on the first and second connectors 21 and 22 are flexed apart as they contact one another, and then reflexed into a locking position.

In the prior art, (1) through (4) above overlapped or occurred virtually simultaneously, so that the force and work required to complete a connection 10 was not only the sum of the forces necessary to overcome the sum of the individual resistances created by (1), (2), (3) and (4) referred to immediately above, but also the force and work to overcome the friction created when forces (1) , (2) , (3) and (4) overlapped, or occurred simultaneously. These frictional resistances included:

a. The friction between the latch 40 on the second connector 22 and the side of the slot 23 as the second connector 22 was being positioned vertically in the slot 23.

b. The friction laterally between the base of the connectors 21 and 22.

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c. The friction between the top or bottom of the second connector 22 and the top or bottom of the slot 23 as the second connector 22 was being positioned vertically within the slot 23.

d. The friction between the detents 31 and 33 and ends 30 and 32 on the first connector 21 into the slot and second connector 22 into the slot 23 as the second connector 22 was being vertically positioned within the slot 23.

In the prior art, in an attempt to reduce the total force and work required, the taper 37 or slope on the leading edge of a prior art connector 15, as seen in Figure 3, was made at a gradual incline, so the frictional forces could be spread throughout the length of the insertion, as the second connector into the slot 23 was being adjusted vertically.

[~~The Present Improvement~~]

The present [~~improvement~~] invention reduces substantially the force necessary to overcome the resistance from the frictions (a), (b), (c) and (d) above and the forces necessary in (3) above to flex the locking latch 40 of the invention toward a closed position, and in (4) above to flex the detents 31 and 33 and ends 30 and 32 relative to one another to create the connector-to-connector interlock.

As in the prior art, in the present [~~improvement~~] invention the cantilevered leaf spring latch 40 continues to be formed, as by punching, from the connector base 39, as seen, for instance, in Figures 2 and 2a. The latch of the prior art, designated 10 as seen in Figures 3 and 3a, is in the form of a straight lever 11, pivoted at 12. It forms an acute sharp angle with the base 13 of prior art connector 15.

In the [~~improvement of the~~] present invention, the latch of the invention 40, as seen in Figures 2 and 2a, herein, is formed from the base 41 with a radius 42, for instance 0,1 cm (0,04 inches), before extending in straight lever fashion. The straight portion 43 of the latch of the invention 40 forms an angle of about 429 with the base 41. Such a curve

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in locking latch 40 increases the distance 46 the second connector 21 or 22, enters into the slot 23 before it contacts the side of the slot 23 at 47 to create a resistance from such latch of the invention 40 against the side of the slot 23. Such a curved locking latch of the invention 40 also reduces the distance 48 the latch of the invention 40 is in contact with the side of the slot 23 as it is being flexed toward a closed position as it passes through the slot 23, since it contacts the latch 40 closer to the end of the latch than does prior art straight latch 10.

Representative dimensions for the locking latch 40 of the invention are shown in Figure 2a.

Further, the first contact of the latch of the invention 40 with the side of the slot 23 is further out from the point 51 of the latch of the invention 40 where it is joined to on the base 41, since part of the curved part of the latch of the invention 40 extends in the plane of the base 41 and is not exposed to contact by the side of the slot 23. Point 51 is the cutting start and the bending start of the latch of the invention 40 as seen in Figure 2a.

Thus, the force exerted by the side of the slot 23 as the latch of the invention 40 passes through the slot is applied further from the pivot point 51 than in the prior art, thus requiring less force to pivot the latch of the invention 40, than in the prior art straight lever latch 10, since the force has a greater lever arm in the latch of the invention 40 when it meets the side of slot 23 as it is thrust into the connection.

Thus, less force over a shorter distance is required to collapse the latch of the invention 40 than was required to collapse latch 10 in the prior art. This results in substantially less work that has to be done to make a connection. This beneficial effect in one connection, is multiplied by the many connections required in forming a ceiling grid for a suspended ceiling.

In the connection improved by the present invention, during the time the connector is being inserted, it is necessary to adjust the connector vertically, so that when fully inserted, the connector fits vertically into the slot 23 .

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Since the force necessary to collapse the latch 10 of the prior art was substantial, and arose near the leading edge of the connector, the taper that guided the connector vertically to its fully seated position so that the connector was in place vertically when fully inserted, was gradual, to limit the added resistance at any one point in the insertion.

Thus, even when the connector-to-connector interlock was being created, wherein the detents were flexing, the connector was still being adjusted vertically, in view of such necessity to make the taper gradual rather than abrupt, thereby creating still more resistance.

In the present invention, the taper 38 at the leading edge of the connector 21, 22 is made relatively abrupt, at a steeper angle, so that a relative immediate adjustment is made vertically to the connector as it is being inserted into the slot 23. Even though a more steep, immediate adjustment would normally require a greater insertion force than that of a gradual insertion, there is less, rather than more force required. This reduction in force is obtained by the delayed contact of the locking latch of the invention 40 with the side of slot 23, since there is virtually no drag or resistance from the locking latch of the invention 40.

There is a further benefit that is achieved by early vertical positioning of the connector within the slot 23 during insertion. As the detents 31 and 33, and the ends 30 and 32 of the first and second connectors of the invention 20 and 21 come into contact, the detents and ends are at a position relative to one another, vertically, where there is least resistance to flexing of these elements laterally into the locking position. Whereas in the prior art, contact was made between detents and ends, and force was exerted between these elements, off-center from their most flexible position, the force required to flex the detents and ends, was again substantial.

Figures 3 and 3a show a prior art connector, while Figures 2 and 2a show a locking connector ~~with the improvement~~ of the invention.

As seen in Figures 3 and 3a, prior art latch 10 in the form of straight lever 11, is pivoted at an acute angle to base 13 of a prior art connector 15. Dotted line 17

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represents, in the enlarged portion, the side of slot 23 as the connector 15 of the prior art is inserted into the slot 23. The prior art connector 15 travels the distance at 16 before it encounters the side of the slot at 19, which is at a distance 18 from the end of the prior art latch 10.

In Figures 2 and 2a, there is shown the connector of the invention 22, which is identical to the connector of the invention 21, with the latch of the invention 40. Again, as in Figure 3a, dotted line 17 in the enlarged portion, represents the side of slot 23 as the connector 22 is inserted into the slot 23. The connector 22 travels the distance 46 before it encounters the side of the slot 23 at 47. This is a distance 48 from the end of the latch of the invention 40.

The benefits of the present ~~[improvement]~~ invention over the prior art are shown graphically in Figures 4a, 4b and 4c.

Figure 4, including 4a, 4b, and 4c, shows the resistances encountered in a prior art connection compared to the forces encountered in a connection with the improved connector of the invention.

In the prior art, the line from 80 to 81 represents the resistance encountered during the initial insertion of the second connector into the slot, while the latch 10 is being flexed from its initial contact with the side of the slot 23, until the resistance reaches its highest at about 27 pounds at point 81.

The contact of the straight lever 11 of prior art latch 10 is relatively close to the pivot 12 during this travel. At 81, there is a drop off in resistance during travel to point 82 to about 10 pounds. The straight lever latch 10 of the prior art during this drop off, contacts the side of the slot 23 further out along its straight lever 11, as it travels through the slot 23, so less force is necessary, since the lever arm is longer than at the initial contact.

At 82 there is a rise again in resistance due to the flexing of the detents 31 and 33 and connector ends 30 and 32 while they are forming a connector-to-connector lock. The resistance rises to point 83 at which point the connector-to-connector lock

(94)

is completed, and all elements have reflexed to a rest position with no further resistance or movement occurring.

The forces required to overcome the resistance encountered in making a connection with the improvement of the invention is shown graphically in Figure 4a. The same movement of the second connector 22 into the slot 23, having the latch of the invention 40, is shown, as was shown with the prior art connector, in Figure 4a. Initial contact with the side of the slot 23 occurs at 90 and rises to 91 where there is a resistance of about 14 pounds. There is a very slight drop off in resistance as the latch of the invention 40 passes through the slot. The resistance then rises to point 93 at about 16 pounds while the connector-to-connector lock is being formed as the detents 31 and 33 and connector ends 30 and 32 are flexing, after which there is a drop off at point 94, where all resistance ends after the connector-to-connector lock is formed.

The force necessary, and the distance over which the force must be applied, is obviously remarkably less, in making the connection, with [~~the present improvement~~] [~~in~~] the locking connector of the present invention.

Figure 4c overlaps the charts of Figures 4a and 4b with the locked position of the prior art connection, and the connection of the invention as an overlapped common point along the horizontal axis at 96. ΔX in the chart represent the distance of the delay in contact between the prior art latch 15, and the latch of the invention 40, with the side 17 of the slot 23, as the second connector into the slot is being inserted. Again, Figure 4c, in chart form, represents the substantial reduction in force, and work necessary to make the present connection, over that to make the prior art connection.

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CLAIMS

1. A locking connector (21, 22) for a suspended ceiling grid comprising a main beam (20) and cross beams (26, 27),
   - wherein the locking connector (21) is designed to be stabbed through a slot (23) in the main beam (20) to lock with an opposing identical locking connector (22) already in the slot (23) and has a cantilevered locking latch (40) being integral with and pivoted from a base (41) in the locking connector (21), and
   - wherein, when the locking connector (21, 22) is stabbed through the slot (23) in the main beam (20), the locking latch (40) can be forced by a side of the slot (23) to flex toward the base (41) to permit the locking latch (40) to pass through the slot (23), and when the locking connector (21, 22) has been stabbed through the slot (23), the locking latch (40) can flex back to its relaxed position wherein it is pivoted away from the base (41),

   characterized in that the locking latch (40) is formed with a curved portion before extending in straight lever fashion.

2. The locking connector according to claim 1, characterized in that the curved portion forms a radius of about 0.1 cm (0.04 inches).

3. The locking connector according to claim 1, characterized in that the locking latch (40) has a straight portion (43) which forms an angle of about 42° with the base (41).

4. The locking connector according to claim 1, characterized in that a delay in contact between the side of the slot (23) and the locking latch (40) is provided when the locking connector (21, 22) is stabbed through the slot (23).

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FIG. I

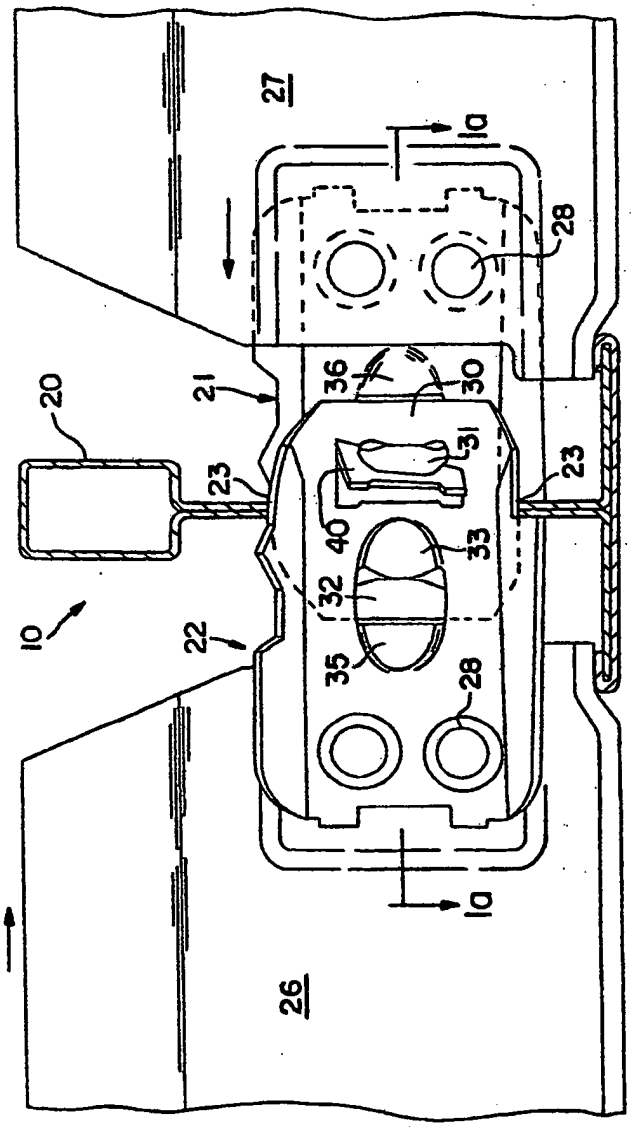
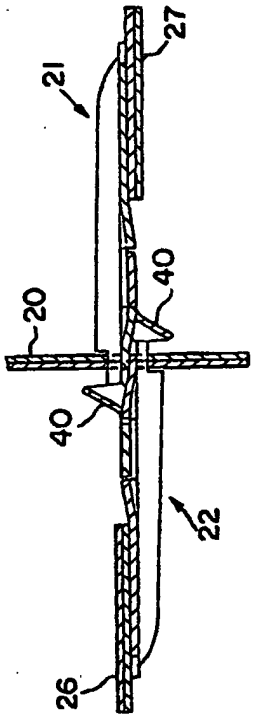


FIG. Ia



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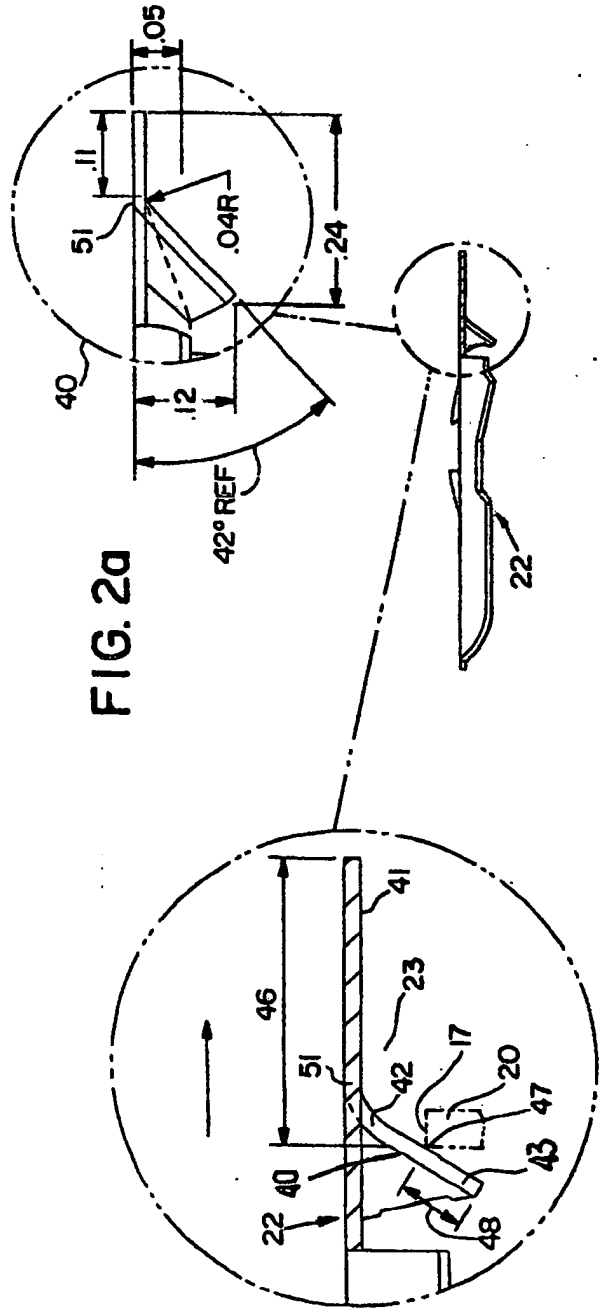

FIG. 2a

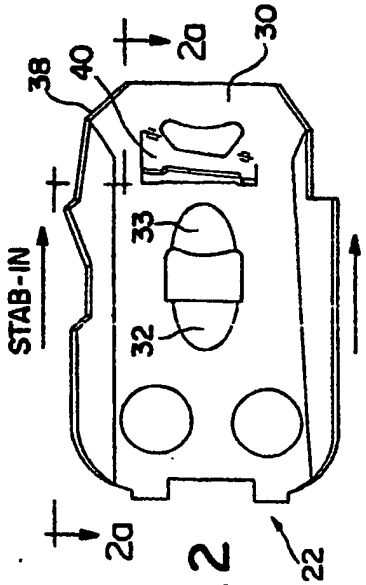

FIG. 2

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86347.8

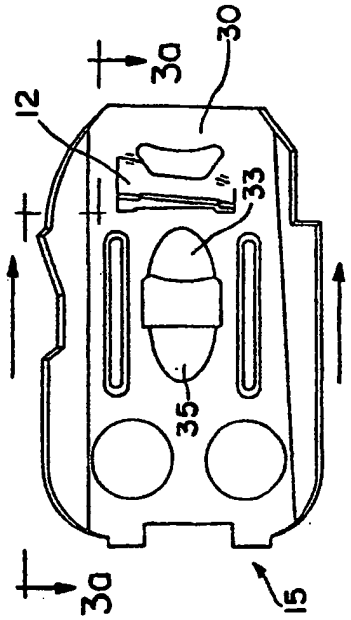

FIG. 3
PRIOR ART

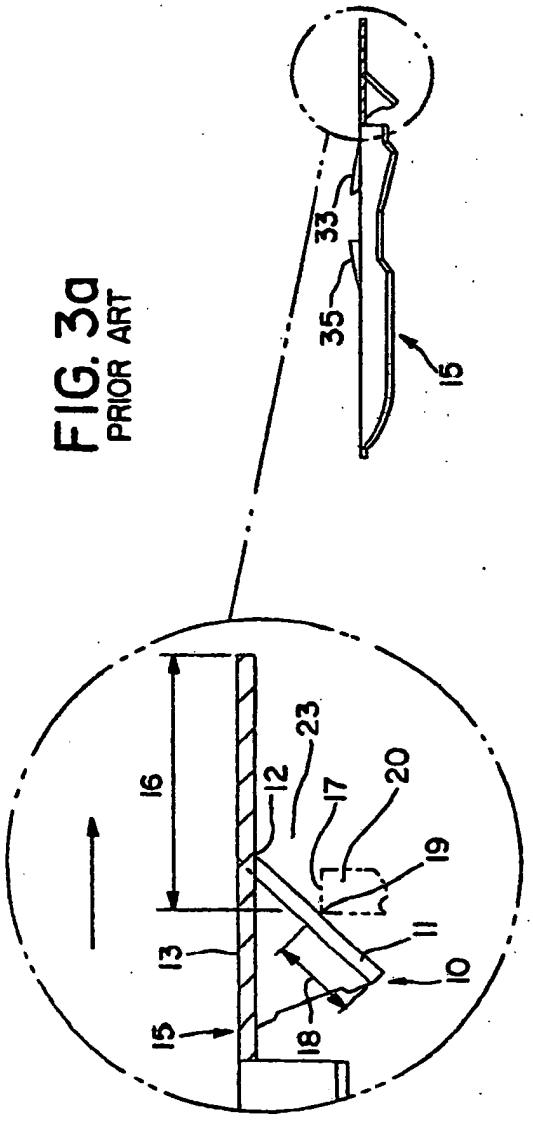

FIG. 3a
PRIOR ART

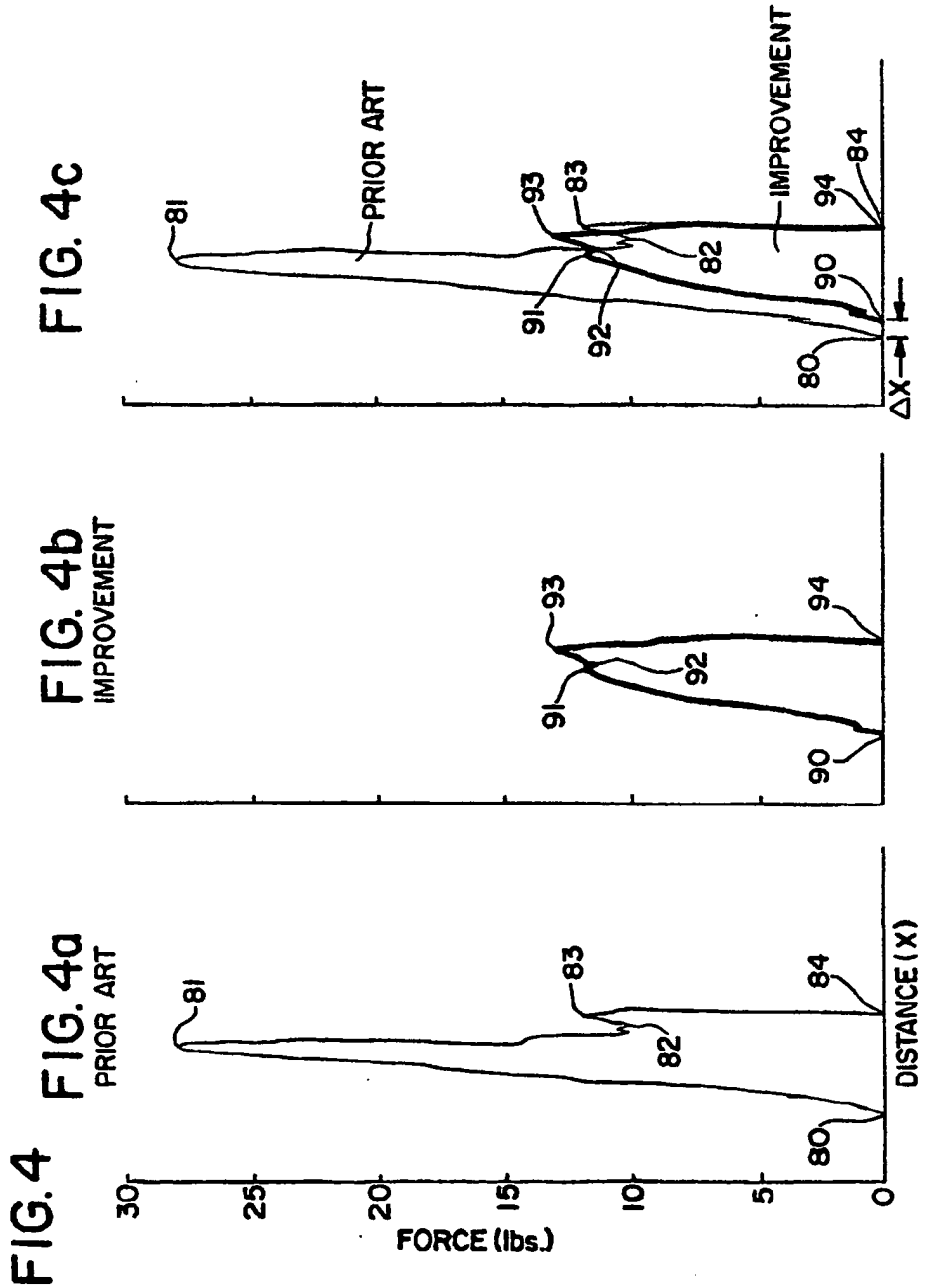
FIG. 4
FIG. 4a
PRIOR ART
FIG. 4b
IMPROVEMENT
FIG. 4c
PRIOR ART
IMPROVEMENT
81
82
83
84
80
91
92
93
94
90
ΔX
30
25
20
15
10
5
0
FORCE (lbs.)
DISTANCE (X)

100

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Exhibit 1a

Belgium

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CONNECTEUR DE VERROUILLAGE

ARRIÈRE-PLAN DE L'INVENTION

Des plafonds suspendus sont largement utilisés dans les bâtiments commerciaux et industriels. Dans de tels plafonds, une ossature de grille métallique de poutres principales et de traverses interconnectées est accrochée à un plafond de construction par des câbles. La grille supporte des panneaux acoustiques dans des ouvertures rectangulaires formées dans la grille.

Cette invention concerne des connecteurs de verrouillage utilisés dans la grille pour raccorder une paire de traverses opposées et une poutre principale au niveau des intersections de la grille.

Des plafonds suspendus comportant des poutres métalliques interconnectées dans une grille qui supporte des panneaux sont bien connus (Brevets des Etats-Unis U.S. 5 839 246 ou U.S. 6 178 712, par exemple).

La grille dans de tels plafonds comporte, au niveau de chaque intersection de grille, une paire de traverses opposées et une poutre principale qui forment une connexion.

Chaque traverse dans une telle connexion comporte un connecteur au niveau de son extrémité qui est poussé, ou planté, depuis les côtés opposés de la poutre principale, à travers une fente dans la poutre principale. Les connecteurs sont tous identiques.

Le connecteur qui est tout d'abord inséré dans la fente est empêché d'être retiré hors de la fente par le loquet en porte-à-faux dans le connecteur, sous la forme d'un ressort à lame flexible pivotant. Un tel loquet, qui est une partie intégrante de la base du connecteur et formé à partir de celle-ci par poinçonnage, est sollicité vers une position ouverte. Le loquet, qui est en porte-à-faux à un angle par rapport à la base du connecteur, fléchit vers une position fermée en étant limité par le côté de la fente lorsque le connecteur est planté à travers la fente pour réaliser la connexion, mais fléchit ensuite vers l'arrière vers sa position de repos sollicitée pour empêcher le retrait du connecteur hors de la fente.

Un autre connecteur sur une traverse opposée, identique au premier connecteur poussé à travers la fente, est ensuite planté à travers la fente dans l'espace réduit dans la fente à côté du premier. Le loquet sur le connecteur contacte le côté de la fente près de l'axe du loquet, et est fléchi vers une position fermée.

Particulièrement en insérant le deuxième connecteur dans la fente, avec un mouvement de plantage linéaire, un travail et une force substantiels sont nécessaires pour effectuer la connexion.

La résistance survient pratiquement immédiatement à mesure que le deuxième connecteur dans la fente entre dans la fente, et continue tout au long du déplacement du connecteur jusqu'à ce qu'il repose dans une position verrouillée, comme on le décrira ci-dessous, avec le premier connecteur dans la fente.

Les deux connecteurs s'interconnectent lorsque le deuxième connecteur est entièrement inséré dans la fente. Des crans formés à partir de la base du connecteur, sous la forme de bulbes, qui comportent un côté came et un côté verrouillage, et les extrémités des connecteurs, fléchissent et fléchissent en retour pour se mettre en prise selon ce que l'on appelle quelquefois un verrouillage connecteur-à-connecteur, ou verrouillage « de liaison ». Une telle connexion « de liaison » entre les connecteurs empêche les connecteurs d'être linéairement tirés à écart hors de la fente. Les connecteurs sont maintenus latéralement et verticalement ensemble par la fente dans la poutre principale.

Dans la position verrouillée de repos, le deuxième connecteur est aligné horizontalement avec le premier connecteur à l'intérieur des limites de la fente, de sorte que les crans de verrouillage sur les connecteurs sont engagés et retenus au même niveau pour former le verrouillage connecteur-à-connecteur. Généralement, le deuxième connecteur doit être soit élevé soit enfoncé à mesure qu'il passe dans la fente pour atteindre un tel alignement horizontal. Ainsi, le profil du bord d'attaque du connecteur est effilé pour guider le connecteur pendant son déplacement à travers la fente de la poutre principale.

De tels connecteurs de type générique sont décrits, par exemple, dans les documents U.S. 5 839 246 ou U.S. 4 317 641. Cette technique antérieure concerne un connecteur de verrouillage pour une grille de plafond suspendu telle que décrite dans le préambule de la revendication 1.

RÉSUME DE LA PRÉSENTE INVENTION

Le but de la présente invention est de proposer un connecteur de verrouillage qui nécessite beaucoup moins de force et moins de travail pour effectuer la connexion.

Moins de travail et moins de force sont nécessaires du fait que, en insérant le deuxième connecteur dans la zone réduite de la fente de la poutre principale,

(1) il existe un retard de contact entre le loquet de verrouillage et le côté de la fente, de sorte que pendant le retard, (2) des éléments lors de la connexion suivante sont positionnés tout en offrant une moindre résistance aux forces de friction à une telle position, et (3) lorsque le contact entre les éléments se produit, les éléments sont positionnés pour offrir une moindre résistance à la réalisation d'une connexion.

Pour atteindre ce qui précède, le loquet de verrouillage, qui dans sa position non fléchie, doit s'étendre latéralement suffisamment loin hors de la base du connecteur pour empêcher le retrait du premier connecteur à travers la fente avant que le deuxième connecteur soit inséré, est formé avec une partie incurvée avant de s'étendre à la manière d'un levier rectiligne.

Ceci, tel que mis en avant en (1) ci-dessus, retarde le contact entre le loquet et le côté de la fente, lorsque le deuxième connecteur est inséré dans la fente, et tel que mis en avant en (2) ci-dessus, un tel contact est établi en outre le long du loquet par rapport au point de pivot, plus près de l'extrémité du loquet, créant un bras de levier plus long, de sorte que moins de force est nécessaire pour fermer le loquet.

L'extrémité extérieure du loquet de verrouillage dans une position non fléchie, s'étend vers la même position que le loquet rectiligne de la technique antérieure pivoté à un angle aigu pointu. Cette position est nécessaire, de sorte que le connecteur ne peut pas être retiré après que le loquet ait traversé la fente.

De même, pendant le retard en (1) ci-dessus, le deuxième connecteur dans la fente est positionné verticalement par la conicité de l'extrémité avant du connecteur, qui s'engage soit avec le haut soit avec le bas de la fente, au même niveau horizontal que le premier connecteur, sans résistance à la friction créée dans la connexion de la technique antérieure, où le loquet de verrouillage force pratiquement immédiatement les première et deuxième connexions latéralement ensemble.

En ajustant le deuxième connecteur dans la fente plus rapidement verticalement à mesure qu'il se déplace à travers la fente, les crans de verrouillage et les extrémités de connecteur qui s'engagent ensemble par flexion se trouvent dans une position telle que mise en avant en (3) ci-dessus, pour offrir une moindre résistance à une telle mise en prise.

BRÈVE DESCRIPTION DES DESSINS

La Figure 1 est une vue latérale droite en élévation d'une connexion de deux traverses à travers une fente dans la poutre principale, montrant les connecteurs de l'invention engagés selon un verrouillage connecteur-à-connecteur.

La Figure 2 est une vue latérale droite en élévation du connecteur de l'invention, représentée dans la connexion de la Figure 1.

La Figure 2a est une vue en coupe de dessus du connecteur de l'invention, prise sur la ligne A-A de la Figure 2, avec une partie entourée agrandie montrant le loquet de l'invention.

Les Figures 3 et 3a sont des vues d'une technique antérieure correspondant aux vues des Figures 2 et 2a.

La Figure 3 est une vue en élévation latérale d'un connecteur de la technique antérieure.

La Figure 3a est une vue en coupe de dessus d'un connecteur de la technique antérieure prise sur la ligne A-A de la Figure 3, avec une partie entourée agrandie montrant un loquet de la technique antérieure.

La Figure 4 est un ensemble de graphiques 4a, 4b et 4c qui représentent les forces impliquées dans la réalisation d'une connexion.

La Figure 4a est un graphique de la force nécessaire pour surmonter la résistance dans la réalisation de la connexion de la technique antérieure.

La Figure 4b est un graphique de la force nécessaire pour surmonter la résistance dans la réalisation de la connexion de l'invention.

La figure 4c est un graphique des forces représentées sur les figures 4a et 4b superposées.

DESCRIPTION DU MODE DE RÉALISATION PRÉFÉRÉ

Sur les présents dessins, une connexion de l'invention est montrée sur les Figures 1, 1a et l'invention est montrée plus clairement sur les Figures 2 et 2a. Dans la présente connexion, la poutre principale 20, représentée en coupe, s'étend longitudinalement dans une grille de plafond. Des connecteurs identiques 21 et 22 ont été plantés à travers une fente 23 dans l'âme 25 de la poutre principale 20 et interconnectés. Les connecteurs 21 et 22 sont connectés respectivement aux traverses 26 et 27 par des rivets en 28.

Dans la connexion, il se produit ce qui suit :

(1) L'extrémité 30 du connecteur 21 engage le cran 31 pour former une connexion connecteur-à-connecteur, comme le fait l'extrémité 32 du connecteur 22 qui engage le cran 33 ;

(2) Les loquets de verrouillage 40 sur le connecteur 21 et le connecteur 22 se trouvent dans une position non fléchie ;

(3) Des antireculs 35 et 36 sur les connecteurs 21 et 22 fixent les extrémités 30 et 32 dans le verrouillage connecteur-à-connecteur ;

et

(4) Les connecteurs 21 et 22 sont maintenus latéralement et verticalement contraints à l'intérieur de la fente 23 par la configuration en section transversale des connecteurs, comme cela est bien connu dans la technique.

La configuration générale décrite jusqu'ici se conforme à la technique antérieure.

Dans la réalisation de la connexion représentée sur les Figures 1 et 1a, ainsi que dans les brevets cités, un premier connecteur, soit le connecteur 21 soit le connecteur 22, tous deux étant identiques, est poussé ou planté à travers la fente 23 à la manière de la technique antérieure. Dans cette explication, on suppose que le connecteur 21 est tout d'abord poussé à travers la fente.

Le loquet de verrouillage 40 contacte le côté de la fente 23 et est fléchi suffisamment pour permettre au loquet 40 de passer à travers la fente 23 et fléchi de nouveau en retour vers une position de repos, dans un mouvement unidirectionnel. Dans cette position, le premier connecteur 21 à travers la fente est retenu à l'intérieur de la fente 23.

Le deuxième connecteur 22 est ensuite poussé à travers la fente 23 le long du côté du premier connecteur 21 à travers la fente 23. De nouveau, le loquet de verrouillage 40 contacte le côté de la fente 23, mais maintenant il y a moins d'espace dans la fente du fait qu'un connecteur a déjà été inséré. Le deuxième connecteur 22 dans la fente, à mesure qu'il est poussé à travers la fente 23, fait fléchir le loquet 40 vers une position fermée, jusqu'à ce que le loquet passe à travers la fente après quoi il fléchit vers une position de repos ouverte. Les connecteurs 21 et 22 forment également un verrouillage connecteur-à-connecteur à ce point, comme on peut le voir sur la Figure 1, sur laquelle les crans 31 et 33 et les extrémités des poutres 30 et 32 ont fléchi puis fléchi de nouveau dans une position verrouillée au repos.

Dans ces connexions à enfoncement, à mesure que le deuxième connecteur dans la fente, par exemple le connecteur 22, se déplace à travers la fente 23 vers une position de repos, après que le premier connecteur 21 ait été inséré dans la fente, il se produit ce qui suit :

(1) Le deuxième connecteur 22 est ajusté verticalement à l'intérieur de la fente 23.

(2) Le deuxième connecteur 22 est forcé latéralement par un côté de la fente 23 contre le premier connecteur 21.

(3) Le loquet de verrouillage 40 sur le deuxième connecteur 22 est fléchi vers une position fermée par un côté de la fente 23 jusqu'à ce que le loquet 40 passe à travers la fente 23, puis s'ouvre par action de ressort à une position de repos comme on peut le voir par exemple sur la Figure 1.

(4) Les crans de verrouillage 31 et 33 et les extrémités de connecteurs 30 et 32 des premier et deuxième connecteurs 21 et 22 sont fléchis à écart étant donnés qu'ils se contactent l'un l'autre, puis fléchis de nouveau dans une position de verrouillage.

Dans la technique antérieure, (1) à (4) ci-dessus se chevauchaient ou se produisaient pratiquement simultanément, de sorte que la force et le travail nécessaires pour terminer une connexion 10 étaient non seulement la somme des forces nécessaires pour surmonter la somme des résistances individuelles créées par (1), (2), (3) et (4) concernées immédiatement au-dessus, mais également la force de travail pour surmonter la friction créée lorsque les forces (1), (2), (3) et (4) se chevauchaient ou se produisaient simultanément. Ces résistances à la friction comprenaient :

a. Le frottement entre le loquet 40 sur le deuxième connecteur 22 et le côté de la fente 23 à mesure que le deuxième connecteur 22 était positionné verticalement dans la fente 23.

b. Le frottement latéral entre la base des connecteurs 21 et 22.

c. Le frottement entre le haut ou le bas du deuxième connecteur 22 et le haut ou le bas de la fente 23 à mesure que le deuxième connecteur 22 était positionné verticalement à l'intérieur de la fente 23.

d. Le frottement entre les crans 31 et 33 et les extrémités 30 et 32 sur le premier connecteur 21 dans la fente et le deuxième connecteur 22 dans la fente 23 à mesure que le deuxième connecteur 22 était verticalement positionné à l'intérieur de la fente 23.

Dans la technique antérieure, dans une tentative de réduction de la force et du travail totaux nécessaires, la conicité 37 ou pente sur le bord d'attaque d'un connecteur 15 de la technique antérieure, comme on peut le voir sur la Figure 3, a été réalisée à une pente progressive, de sorte que les forces de friction pouvaient être étendues sur toute la longueur de l'insertion, à mesure que le deuxième connecteur était ajusté verticalement dans la fente 23.

La présente invention réduit substantiellement la force nécessaire pour surmonter la résistance provenant des frottements (a), (b), (c) et (d) ci-dessus et les forces nécessaires en (3) ci-dessus pour faire fléchir le loquet de verrouillage 40 de l'invention vers une position fermée, et en (4) ci-dessus pour faire fléchir les crans 31 et 33 et les extrémités 30 et 32 les uns par rapport aux autres pour créer le verrouillage connecteur-à-connecteur.

Comme dans la technique antérieure, dans la présente invention le loquet à un ressort à lame en porte-à-faux 40 continue d'être formé, comme par

poinçonnage, à partir de la base de connecteur 39, comme on peut le voir par exemple sur les Figures 2 et 2a. Le loquet de la technique antérieure, représenté par la référence numérique 10 comme on peut le voir sur les Figures 3 et 3a, est sous la forme d'un levier rectiligne 11, pivoté en 12. Il forme un angle aigu pointu avec la base 13 du connecteur 15 de la technique antérieure.

Dans la présente invention, le loquet de l'invention 40, comme on peut le voir sur les Figures 2 et 2a, ici, est formé à partir de la base 41 avec un rayon 42, par exemple de 0,1 cm (0,04 pouce), avant de s'étendre à la manière d'un levier rectiligne. La partie rectiligne 43 du loquet 40 de l'invention forme un angle d'environ 429 avec la base 41. Une telle courbe dans le loquet de verrouillage 40 augmente la distance 46, le deuxième connecteur 21 ou 22, entre dans la fente 23 avant de contacter le côté de la fente 23 en 47 pour créer une résistance par rapport au loquet 40 de l'invention contre le côté de la fente 23. Un tel loquet de verrouillage incurvé 40 de l'invention réduit également la distance 48, le loquet 40 de l'invention est en contact avec le côté de la fente 23 à mesure qu'il fléchit vers une position fermée lorsqu'il passe à travers la fente 23, puisqu'il contacte le loquet 40 plus près de l'extrémité du loquet que ne le fait le loquet rectiligne 10 de la technique antérieure.

Des dimensions représentatives pour le loquet de verrouillage 40 de l'invention sont montrées sur la Figure 2a.

De plus, le premier contact du loquet 40 de l'invention avec le côté de la fente 23 se situe en outre plus loin du point 51 du loquet 40 de l'invention où il est raccordé sur la base 41, étant donné qu'une partie de la partie incurvée du loquet 40 de l'invention s'étend dans le plan de la base 41 et n'est pas exposée au contact par le côté de la fente 23. Le point 51 est le début de la coupe et le début du cintrage du loquet 40 de l'invention comme on peut le voir sur la Figure 2a.

Ainsi, la force exercée par le côté de la fente 23 à mesure que le loquet 40 de l'invention passe à travers la fente est appliquée plus loin du point de pivotement 51 que dans la technique antérieure, nécessitant ainsi moins de force pour faire pivoter le loquet 40 de l'invention que dans le loquet à la manière d'un levier rectiligne 10 de la technique antérieure puisque la force comporte un bras de levier plus important dans le loquet 40 de l'invention lorsqu'il rencontre le côté de la fente 23 lorsqu'il est poussé dans la connexion.

Ainsi, moins de force sur une distance plus courte est nécessaire pour plier le loquet 40 de l'invention qu'il était nécessaire pour plier le loquet de 10 de la technique antérieure. Ceci résulte en un travail substantiellement moins important que celui qui était nécessaire pour réaliser une connexion. Cet effet bénéfique dans une connexion est multiplié par les nombreuses connexions nécessaires pour former une grille de plafond pour un plafond suspendu.

Dans la connexion améliorée par la présente invention, pendant le temps d'insertion du connecteur, il est nécessaire d'ajuster le connecteur verticalement, de sorte que lorsqu'il est entièrement inséré, le connecteur s'ajuste verticalement dans la fente 23.

Étant donné que la force nécessaire pour plier le loquet 10 de la technique antérieure était substantielle, et se produisait près du bord d'attaque du connecteur, la conicité qui guidait le connecteur verticalement vers sa position entièrement reposée de sorte que le connecteur était verticalement en place lorsque totalement inséré, était progressive, pour limiter la résistance additionnée au niveau de n'importe quel point de l'insertion.

Ainsi, même lorsque le verrouillage connecteur-à-connecteur était créé, dans lequel les crans étaient fléchis, le connecteur était toujours ajusté verticalement, au vu d'une telle nécessité de rendre la conicité progressive plutôt qu'abrupte, créant de ce fait encore plus de résistance.

Dans la présente invention, la conicité 38 au niveau du bord d'attaque du connecteur 21, 22 est rendue relativement abrupte, à un angle plus raide, de sorte qu'un ajustement relativement immédiat est réalisé verticalement sur le connecteur étant inséré dans la fente 23. Même si un ajustement immédiat plus raide nécessitait normalement une force d'insertion plus importante que celle d'une insertion progressive, moins de force plutôt que d'avantage est nécessaire. Cette réduction de force est obtenue par le contact retardé du loquet de verrouillage de l'invention 40 avec le côté de la fente 23, étant donné qu'il n'y a virtuellement pas de résistance depuis le loquet de verrouillage de l'invention 40.

Il existe un bénéfice supplémentaire qui est obtenu en positionnant avant verticalement le connecteur à l'intérieur de la fente 23 pendant l'insertion. Étant donné que les crans 31 et 33, et les extrémités 30 et 32 des premier et deuxième connecteurs de l'invention 20 et 21 viennent en contact, les crans et les extrémités se trouvent à des positions relatives les uns par rapport aux autres, verticalement, où il y a moins résistance à la flexion sur ces éléments latéralement dans la position de verrouillage. Alors que dans la technique antérieure, le contact était réalisé entre les crans et les extrémités, et que la force était exercée entre ces éléments, excentrée par rapport à leur position la plus fléchie, la force nécessaire pour fléchir les crans et les extrémités étaient à nouveau substantielle.

Les Figures 3 et 3a montrent un connecteur de la technique antérieure, alors que les Figures 2 et 2a montrent un connecteur de verrouillage de la présente invention.

Comme on peut le voir sur les Figures 3 et 3a, le loquet 10 de la technique antérieure sous la forme d'un levier rectiligne 11, est pivoté à un angle aigu par rapport à la base 13 d'un connecteur 15 de la technique antérieure. La ligne pointillée 17 représente, dans la partie agrandie, le côté de la fente 23 à mesure que le connecteur 15 de la technique antérieure est inséré dans la fente 23. Le

connecteur 15 de la technique antérieure se déplace sur la distance en 16 avant de rencontrer le côté de la fente en 19, qui se trouve à une distance 18 de l'extrémité du loquet 10 de la technique antérieure.

Sur les Figures 2 et 2a, il est montré le connecteur de l'invention 22, qui est identique au connecteur de l'invention 21, avec le loquet de l'invention 40. De nouveau, comme sur la Figure 3a, la ligne pointillée 17 dans la partie agrandie représente le côté de la fente 23 à mesure que le connecteur 22 est inséré dans la fente 23. Le connecteur 20 de se déplace sur la distance 46 avant de rencontrer le côté de la fente 23 en 47. C'est une distance 48 partant de l'extrémité du loquet de l'invention 40.

Les bénéfices de la présente invention par rapport à la technique antérieure sont montrés de manière graphique sur les Figures 4a, 4b et 4c.

La Figure 4, comprenant 4a, 4b et 4c, montre les résistances rencontrées dans une connexion de la technique antérieure comparées aux forces rencontrées dans une connexion avec le connecteur amélioré de l'invention.

Dans la technique antérieure, la ligne allant de 80 à 81 représente la résistance rencontrée pendant l'insertion initiale du deuxième connecteur dans la fente, alors que le loquet 10 est en cours de flexion depuis son contact initial avec le côté de la fente 23, jusqu'à ce que la résistance atteigne son maximum à environ 10 kg (27 pounds) au niveau du point 81.

Le contact du levier rectiligne 11 du loquet 10 de la technique antérieure est relativement proche du pivot 12 pendant ce déplacement. En 81, il y a une diminution de la résistance pendant le déplacement vers le point 82 à environ 3,7 kg (10 pounds). Le loquet de type levier rectiligne 10 de la technique antérieure pendant cette diminution entre en contact avec le côté de la fente 23 plus loin le long de son levier rectiligne 11, à mesure qu'il se déplace à travers

la fente 23, de sorte que moins de force est nécessaire, étant donné que le bras de levier est plus long qu'au niveau du contact initial.

En 82, il y a à nouveau une élévation de la résistance en raison de la flexion des crans 31 et 33 et des extrémités de connecteurs 30 et 32 alors qu'ils forment un verrouillage connecteur-à-connecteur. La résistance s'élève au point 83, point au niveau duquel le verrouillage connecteur-à-connecteur est terminé, et tous les éléments ont fléchi vers une position de repos sans qu'une résistance supplémentaire ou qu'un mouvement ne se produise.

Les forces nécessaires pour surmonter la résistance rencontrée en réalisant une connexion avec l'amélioration de l'invention sont montrées de manière graphique sur la Figure 4a. Le même mouvement du deuxième connecteur 22 dans la fente 23, comportant le loquet 40 de l'invention, est représenté, comme cela était montré avec le connecteur de la technique antérieure, sur la Figure 4a. Le contact initial avec le côté de la fente 23 se produit en 90 et s'élève en 91 où il y a une résistance d'environ 5,2 kg (14 pounds). Il existe une très légère diminution de la résistance à mesure que le loquet 40 de l'invention traverse la fente. La résistance s'élève ensuite au point 93 à environ 6 kg (16 pounds) alors que le verrouillage connecteur-à-connecteur se forme à mesure que les crans 31 et 33 et les extrémités des connecteurs 30 et 32 fléchissent, après quoi il existe une diminution au point 94, où toute la résistance s'arrête après que le verrouillage connecteur-à-connecteur ait été formé.

La force nécessaire, et la distance sur laquelle la force doit être appliquée, est évidemment remarquablement moins importante en réalisant la connexion avec le connecteur de verrouillage de la présente invention.

La Figure 4c reprend en chevauchement les graphiques des Figures 4a et 4b avec la position verrouillée de la connexion de la technique antérieure, et de la connexion de l'invention en tant que point commun chevauché le long de l'axe horizontal en 96. ΔX dans le graphique représente la distance du retard de

contact entre le loquet 15 de la technique antérieure et le loquet 40 de l'invention, avec le côté 17 de la fente 23, à mesure que le deuxième connecteur est inséré dans la fente. D'ailleurs, la figure 4c sous forme de graphique représente la réduction substantielle de la force et du travail nécessaires pour réaliser la présente connexion par rapport à la force et au travail nécessaires pour réaliser la connexion de la technique antérieure.

REVENDICATIONS

1. Connecteur de verrouillage (21, 22) pour une grille de plafond suspendu comprenant une poutre principale (20) et des traverses (26, 27),

- dans lequel le connecteur de verrouillage (21) est conçu pour être planté à travers une fente (23) dans la poutre principale (20) pour se verrouiller avec un connecteur de verrouillage identique opposé (22) déjà dans la fente (23) et comporte un loquet de verrouillage en porte-à-faux (40) étant une partie intégrante d' une base (41) et pivoté depuis celle-ci dans le connecteur de verrouillage (21), et
- dans lequel, lorsque le connecteur de verrouillage (21, 22) est planté à travers la fente (23) dans la poutre principale (20), le loquet de verrouillage (40) peut être forcé par un côté de la fente (23) pour fléchir vers la base (41) pour permettre au loquet de verrouillage (40) de passer à travers la fente (23), et lorsque le connecteur de verrouillage (21, 22) a été planté à travers la fente (23), le loquet de verrouillage (40) peut fléchir en retour vers sa position relâchée dans laquelle il est pivoté à écart de la base (41),

caractérisé en ce que le loquet de verrouillage (40) est formé avec une partie incurvée avant de s'étendre à la manière d'un levier rectiligne.

2. Connecteur de verrouillage selon la revendication 1, caractérisé en ce que la partie incurvée forme un rayon d'environ 0,1 cm (0,04 pouces).

3. Connecteur de verrouillage selon la revendication 1, caractérisé en ce que le loquet de verrouillage (40) comporte une partie rectiligne (43) qui forme un angle d'environ 42° avec la base (41).

4. Connecteur de verrouillage selon la revendication 1, caractérisé en ce qu'un retard de contact entre le côté de la fente (23) et le loquet de verrouillage (40) est prévu lorsque le connecteur de verrouillage (21, 22) est planté à travers la fente (23).

FIG. 1

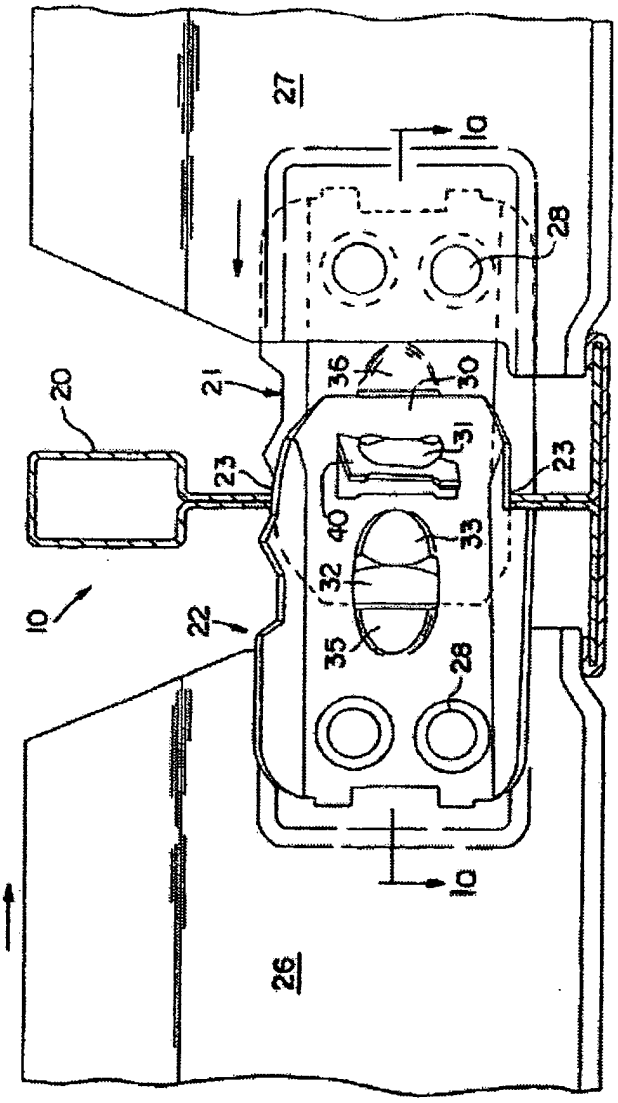
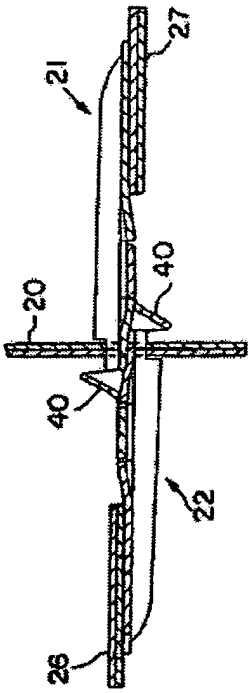


FIG. 1a



120

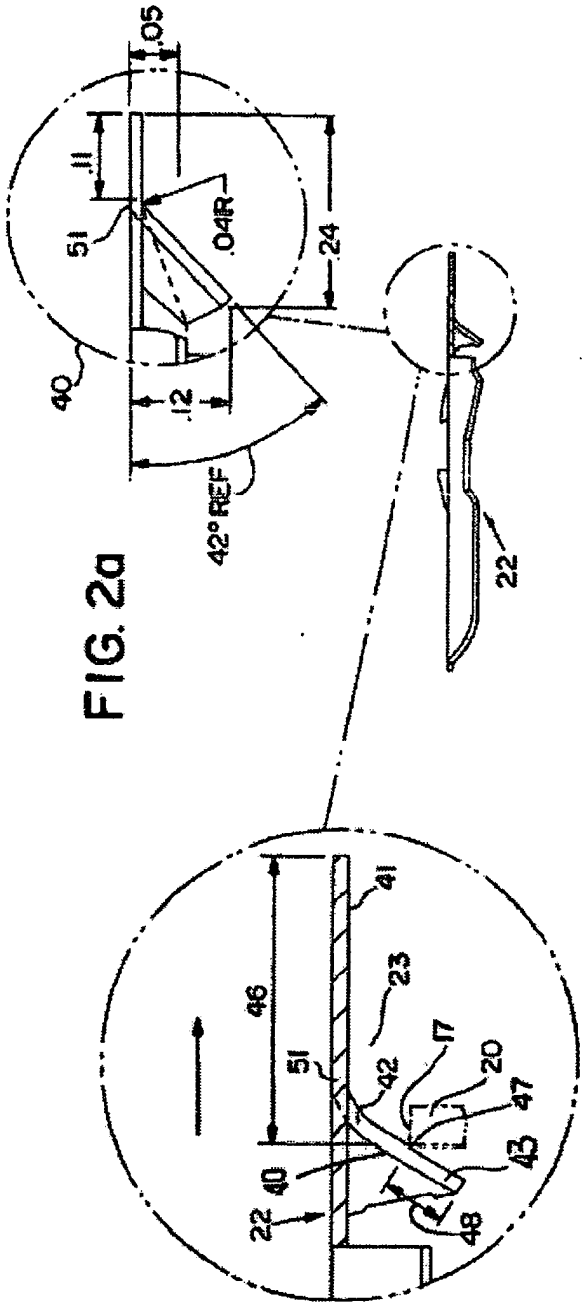

.05
.11
51
.04R
24
40
.12
42° REF
22
41
46
23
51
42
17
20
47
L
43
40
22
48

FIG. 2a

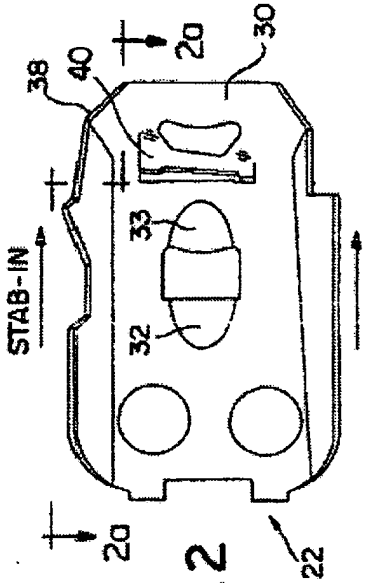

38
40
2a
30
33
32
STAB-IN
2a
22

FIG. 2

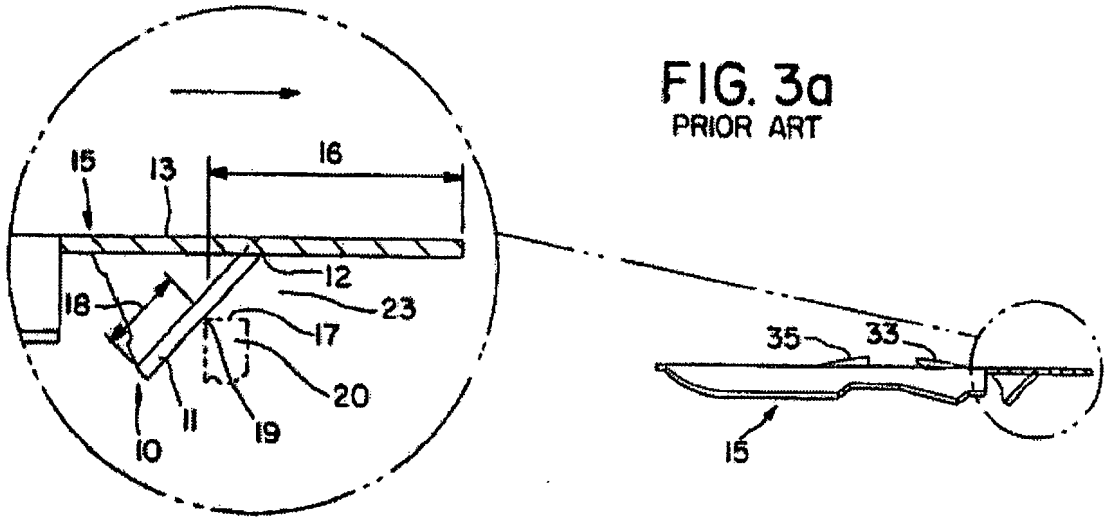


FIG. 3a
PRIOR ART

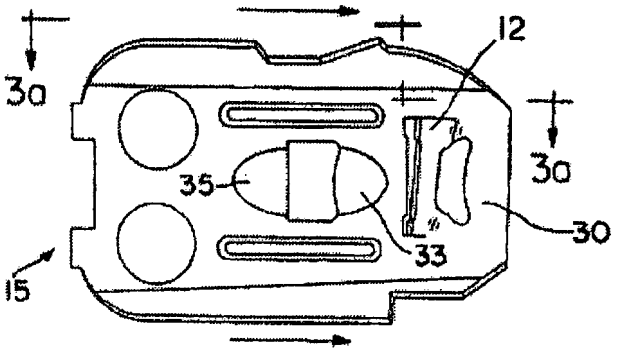


FIG. 3
PRIOR ART

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FIG. 4

FIG. 4a
PRIOR ART

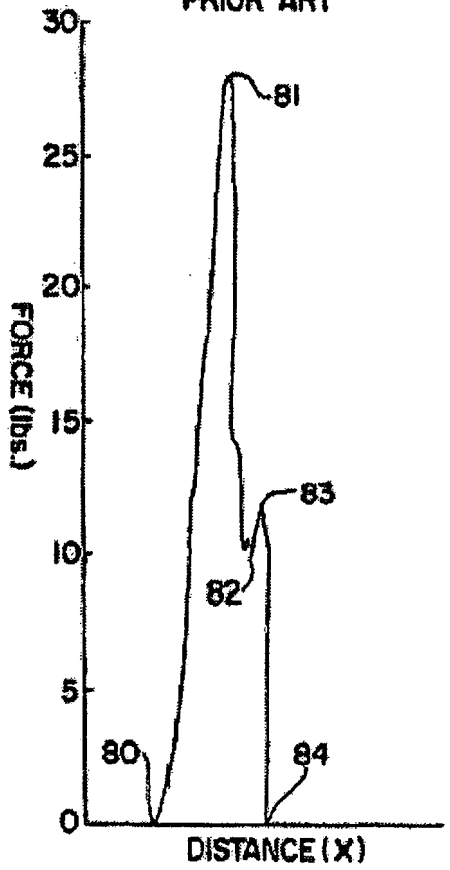

FIG. 4b
IMPROVEMENT

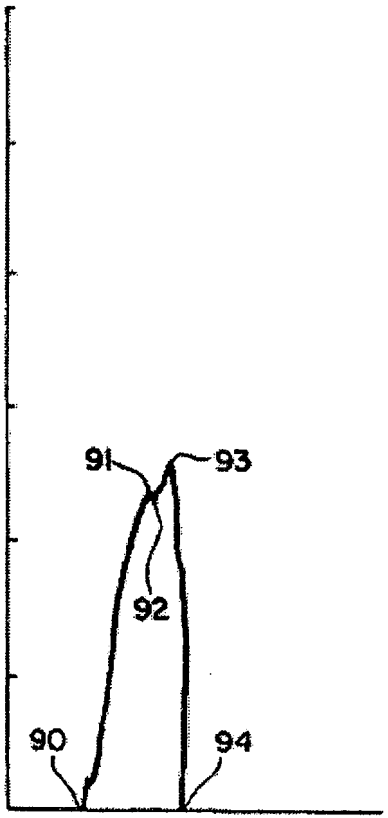

FIG. 4c

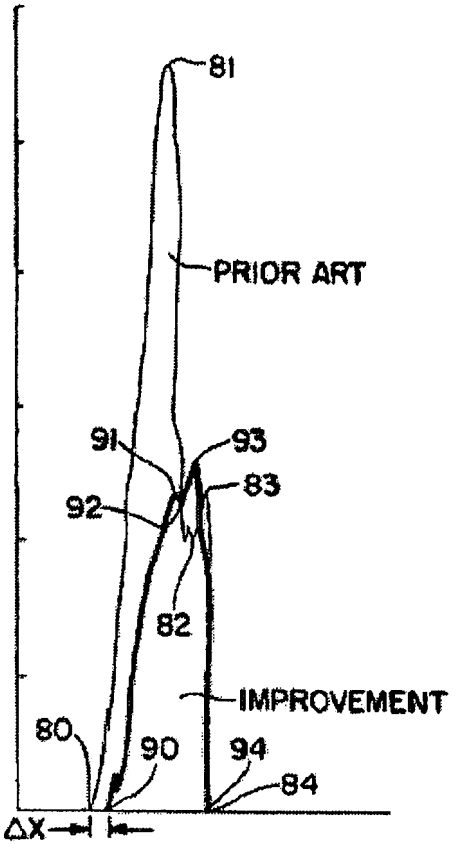

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Exhibit 1b

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EINGEGANGEN
25. Sep. 2008
v. FÜNER EBBINGHAUS FINCK HANO

Betr.: Europäisches Patent mit der Veröffentlichungsnummer

0001553239

Das Europäische Patentamt hat auf die europäische Patentanmeldung 04 02 6847.6 ein Patent mit der im Betreff genannten Veröffentlichungsnummer erteilt.

Das Patent, dessen Wirkung für die Bundesrepublik Deutschland nach Art. 79 Abs. 3 und 97 Abs. 3 EPÜ mit der Veröffentlichung des Hinweises auf die Patenterteilung im Europäischen Patentblatt eintritt, wird beim Deutschen Patent- und Markenamt unter dem Aktenzeichen

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geführt. Es wird gebeten, im Schriftverkehr mit dem Deutschen Patent- und Markenamt und bei Einzahlungen nur noch dieses Aktenzeichen zu verwenden.

Als nächste Jahresgebühr wird die 05. Jahresgebühr fällig. Sie ist an die Bundeskasse Weiden für das Deutsche Patent- und Markenamt einzuzahlen und kann bis zum 02.02.2009 zuschlagfrei entrichtet werden.

Diese Mitteilung wurde maschinell erstellt und wird nicht unterschrieben.

Patentabteilung 08.EP
EP-Geschäftsstelle

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Zahlungshinweise

1. Die Zahlung der Gebühr bestimmt sich nach der Patentkostenzahlungsverordnung (PatKostZV) vom 15.10.2003 (BGBl. I S. 2083).

   Danach können Gebühren wie folgt entrichtet werden:

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   b) durch Überweisung auf das umseitig angegebene Konto der Bundeskasse Weiden für das Deutsche Patent- und Markenamt,

   c) durch (Bar-) Einzahlung mit Zahlschein bei der Postbank oder bei allen Banken und Sparkassen auf das umseitig angegebene Konto der Bundeskasse Weiden für das Deutsche Patent- und Markenamt, oder

   d) durch Übergabe oder Übersendung einer Einzugsermächtigung zu einem Inlandskonto.

2. Bei jeder Zahlung sind das vollständige **Aktenzeichen**, die genaue Bezeichnung des **Anmelders (Inhabers)** und die Gebührennummern in deutlicher Schrift anzugeben. Die Gebührennummern ergeben sich aus dem Gebührenverzeichnis des Patentkostengesetzes (PatKostG) vom 13.12.2001 (BGBl. I S. 3656), das auch im Kostenmerkblatt A 9510 des Deutschen Patent- und Markenamts abgedruckt ist.

   Unkorrekte bzw. unvollständige Angaben führen zu Verzögerungen bei der Bearbeitung.

3. Als **Einzahlungstag** gilt gemäß § 2 PatKostZV

   a) bei Barzahlung der Tag der Einzahlung,

   b) bei Überweisung der Tag, an dem der Betrag auf dem Konto der Bundeskasse Weiden für das Deutsche Patent- und Markenamt gutgeschrieben wird,

   c) bei (Bar-) Einzahlung auf das Konto der Bundeskasse Weiden für das Deutsche Patent- und Markenamt der Tag der Einzahlung.

      Da die Bundeskasse Weiden die Bareinzahlung von der Überweisung nach b) nicht anhand der Buchungsunterlagen zu unterscheiden vermag, sollte der Bareinzahler, wenn er den nach dieser Zahlungsform vorverlagerten Einzahlungstag geltend machen möchte, dem Amt **unverzüglich** den vom Geldinstitut ausgestellten **Einzahlungsbeleg** vorlegen;

   d) bei Übergabe oder Übersendung einer Einzugsermächtigung der Tag ihres Eingangs beim Deutschen Patent- und Markenamt oder beim Bundespatentgericht, bei zukünftig fällig werdenden Gebühren der Tag der Fälligkeit der Gebühr, sofern die Einziehung zugunsten der Bundeskasse Weiden für das Deutsche Patent- und Markenamt erfolgt.

4. Einzugsermächtigungen können auch per Telefax wirksam übermittelt werden.

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Der Anmelder einer mit Wirkung für die Bundesrepublik Deutschland eingereichten Patentanmeldung kann eine Gebrauchsmusteranmeldung, die den gleichen Gegenstand betrifft, einreichen und gleichzeitig den Anmeldetag der früheren Patentanmeldung in Anspruch nehmen. Diese Abzweigung (§ 5 Gebrauchsmustergesetz) ist bis zum Ablauf von 2 Monaten nach dem Ende des Monats möglich, in dem die Patentanmeldung durch rechtskräftige Zurückweisung, freiwillige Rücknahme oder Rücknahmefiktion erledigt, ein Einspruchsverfahren abgeschlossen oder - im Falle der Erteilung des Patents - die Frist für die Beschwerde gegen den Erteilungsbeschluss fruchtlos verstrichen ist. Ausführliche Informationen über die Erfordernisse einer Gebrauchsmusteranmeldung, einschließlich der Abzweigung, enthält das Merkblatt für Gebrauchsmusteranmelder (G 6181), welches kostenlos beim Deutschen Patent- und Markenamt und den Patentinformationszentren erhältlich ist.

Exhibit 1c

Spain

AA

FECHA DE PRESENTACIÓN
12-11-08

TRADUCCIÓN DE UNA PATENTE EUROPEA QUE DESIGNA A ESPAÑA

Nº DE SOLICITUD PATENTE EUROPEA (1)	Nº DE PUBLICACIÓNPATENTE EUROPEA CONCEDIDA (2)
04026847.6	**1553.239**

TITULAR/ES	APELLIDOS O DENOMINACIÓN JURÍDICA	NOMBRE (4)
(3) **WORTHINGTON ARMSTRONG VENTURE**		

DATOS DEL TITULAR/ES (5)

DOMICILIO **Suite 200, 9 Old Lincoln Highway**
LOCALIDAD **MALVERN, PA 19355**
PAÍS RESIDENCIA **ESTADOS UNIDOS** TELÉFONO
NACIONALIDAD **ESTADOUNIDENSE** CÓDIGO NACIÓN **US**

REPRESENTANTE: (6)

D. JAVIER UNGRIA LOPEZ 392/1
Avda. Ramón y Cajal, 78. 28043 MADRID

Nº PODER GENERAL (7)

TÍTULO DE LA INVENCIÓN (EN ESPAÑA) (8)

CONECTOR DE BLOQUEO

DE CONFORMIDAD CON LO DISPUESTO EN EL CAPÍTULO V DEL R.D. 2424/1986, DE 10 DE OCTUBRE SE PRESENTA LA TRADUCCIÓN DEL FASCÍCULO DE LA PATENTE EUROPEA ARRIBA MENCIONADA PARA QUE DICHA PATENTE SURTA EFECTOS EN ESPAÑA.

RELACIÓN DE DOCUMENTOS QUE SE ACOMPAÑAN (9)

- [x] PRIMERA PÁGINA FASCÍCULO PATENTE EUROPEA PUBLICADO POR LA OEP (a)
- [x] TRADUCCIÓN DEL FASCÍCULO (b) (SOPORTE MAGNETICO)
- [x] DIBUJOS (EN SU CASO) (c)
- [x] AUTORIZACIÓN AL REPRESENTANTE (d)
- [x] JUSTIFICANTE DEL PAGO DE LAS TASAS (e)

FIRMA DEL TITULAR/ES O REPRESENTANTE/S (10)

Elias Dugnol Fernandez
Apoderado

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Spanish Translation of European Application as Published

DESCRIPCIÓN

ANTECEDENTED DE LA INVENCIÓN

[0001] Los techos suspendidos se utilizan con gran extensión en edificios comerciales e industriales. En tales techos, un armazón de tela metálica de vigas principales y vigas transversales interconectadas está suspendido desde un techo estructural por medio de alambres. La rejilla soporta paneles acústicos en aberturas rectangulares formadas en la rejilla.

[0002] Esta invención se refiere a conectores de bloqueo utilizados en la rejilla para unir una pareja de vigas transversales opuestas y una viga principal en las intersecciones de la rejilla.

[0003] Los techos suspendidos, que tienen vigas metálicas interconectadas en una rejilla que soporta paneles son bien conocidos (Patentes de los Estados Unidos U.S. 5.839.246 o U.S. 6.178.712, por ejemplo).

[0004] La rejilla en tales techos tiene, en cada intersección de la rejilla, una pareja de vigas transversales opuestas y una viga principal que forman una conexión.

[0005] Cada viga transversal en tal conexión tiene un conector en su extremo que es empujado o perforado desde lados opuestos de la viga principal, a través de una ranura en la viga principal. Todas las conexiones son idénticas.

[0006] Se previene que el conector que es insertado primero en la ranura sea extraído fuera de la ranura por

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el enganche en voladizo en el conector, en forma de una lámina de resorte flexible en pivote. Tal enganche, que es integral con la base del conector y se forma desde allí mediante estampación, está desviado hacia una posición abierta. El enganche, que está en voladizo en un ángulo desde la base del conector, se dobla hacia una posición cerrada bajo la restricción del lado de la ranura cuando el conector está insertado a través de la ranura para realizar la conexión, pero que se dobla de nuevo hacia atrás hacia su posición de reposo desviada para prevenir la extracción del conector fuera de la ranura.

[0007] Otro conector sobre una viga transversal opuesta, idéntico al primer conector empujado a través de la ranura, es introducido entonces a través de la ranura en el espacio reducido en la ranura al lado del primero. El enganche en el conector contacta con el lado de la ranura próximo al pivote de enganche, y se dobla hacia una posición cerrada.

[0008] Insertando particularmente el segundo conector en la ranura, con un movimiento de entrada lineal, se requiere trabajo y fuerza sustanciales para realizar la conexión.

[0009] Esta resistencia se deriva de forma inmediata virtualmente a medida que el segundo conector entre en la ranura, y continúa el recorrido a través de la unidad de conector hasta que se asienta en una posición bloqueada, como se describe más adelante, con el primer conector dentro de la ranura.

[0010] Ambos conectores se interconectan cuando el segundo conector está totalmente insertado en la ranura.

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Unos retenes formados desde la base del conector, en forma de protuberancias, que tienen un lado de leva y un lado de bloqueo, y los extremos de los conectores flexiones y reflexionan para acoplarse en lo que se refiere a veces como una caja de conector-a-conector o caja de "sincronización". Tal conexión de "sincronización" entre los conectores previene que los conectores sean separados linealmente fuera de la ranura. Los conectores se mantienen juntos lateral y verticalmente por la ranura en la viga principal.

[0011] En la posición bloqueada asentada, el segundo conector está alineado horizontalmente con el primer conector dentro de los confines de la ranura, de manera que los retenes de bloqueo sobre los conectores son acoplados y retenidos al mismo nivel para formar el bloqueo de conector-a-conector. Generalmente, el segundo conector o bien debe ser elevado o rebajado a medida que pasa dentro de la ranura para conseguir tal alineación horizontal. Por lo tanto, el perfil del borde delantero del conector está biselado para guiar el conector durante su recorrido a través de la ranura de la viga principal.

[0012] Tales conexiones de tipo genérico se describen, por ejemplo, en los documentos U.S. 5.839.246 o U.S. 4.317.641. Esta técnica anterior se refiere a un conector de bloqueo para una rejilla de techo suspendido, como se describe en el preámbulo de la reivindicación 1.

RESUMEN DE LA PRESENTE INVENCIÓN

[0013] El objeto de la presente invención es proporcionar un conector de bloqueo que requiere mucha menos fuerza y menos trabajo para realizar la conexión.

[0014] Se requiere menos trajo y menos fuerza porque, insertando el segundo conector en la zona reducida de la ranura de la viga principal, (1) existe un retraso en el contacto entre el enganche de bloqueo y el lado de la ranura, de manera que durante el retraso, (2) unos elementos de la conexión siguiente están colocados de manera que ofrecen la mínima resistencia a fuerzas de fricción hasta tal posición, y (3) cuando se produce el contacto entre elementos, los elementos son colocados para ofrecer la mínima resistencia para realizar la conexión.

[0015] Para conseguir lo anterior, el enganche de bloqueo que, en su posición no flexionada, debe extenderse lateralmente suficientemente fuera de la base del conector para prevenir la extracción del primer conector a través de la ranura antes de que se inserte el segundo conector, está formado con una porción curvada antes de extenderse en forma de palanca recta.

[0016] Esto, como se ha indicado anteriormente en (1), retrasa el contacto entre el enganche y el lado de la ranura, cuando el segundo conector es insertado en la ranura y, como se ha indicado anteriormente en (2), tal contacto se realiza más hacia fuera a lo largo del enganche desde el punto de pivote, más cerca del extremo del enganche, creando un brazo de palanca mayor, de manera que se necesita menos fuerza para cerrar el enganche.

[0017] El extremo exterior del enganche de bloqueo en una posición no flexionada se extiende hasta la misma posición que el enganche recto de la técnica anterior pivotado en un ángulo agudo cerrado. Esta posición es necesaria para que el conector no pueda ser extraído

después de que el enganche ha pasado a través de la ranura.

[0018] Además, durante el retraso indicado anteriormente en (1), el segundo conector está siendo colocado en la ranura verticalmente por el chaflán sobre el extremo delantero del conector, que se acopla o bien con la parte superior o las parte inferior de la ranura, hasta el mismo nivel horizontal que el primer conector, sin resistencia de fricción creada en la conexión de la técnica anterior, donde el enganche de bloqueo, de forma virtualmente inmediata, fuerza la primera y la segunda conexión lateralmente juntas.

[0019] Ajustando el segundo conector en la ranura en dirección vertical más rápidamente que avanza a través de la ranura, los retenes de bloqueo y los extremos de conector que se acoplan juntos por flexión, están en una posición, como se indica anteriormente en (3) para ofrecer la mínima resistencia a tal acoplamiento.

BREVE DESCRIPCIÓN DE LOS DIBUJOS

[0020]

La figura 1 es una vista en alzado del lado derecho de una conexión de dos vigas transversales a través de una ranura en la viga principal, que muestra los conectores de la invención acoplados en un bloqueo de conector-a-conector.

La figura 2 es una vista en alzado del lado derecho del conector de la invención, mostrado en la conexión de la figura 1.

La figura 2a es una vista de la sección superior del

conector de la invención, tomada en la línea A-A de la figura 2, con una porción ampliada rodeada con un círculo que muestra el enganche de la invención.

Las figuras 3 y 3a son vistas de una técnica anterior que corresponde a las vistas de las figuras 2 y 2a.

La figura 3 es una vista en alzado lateral de un conector de la técnica anterior.

La figura 3a es una vista en sección superior de un conector de la técnica anterior tomada sobre la líneas A-A de la figura 3, con una posición ampliada rodeada con un círculo que muestra un enganche de la técnica anterior.

La figura 4 es un grupo de grafos 4a, 4b y 4c que representan las fuerzas implicadas en la realización de una conexión.

La figura 4a es un grafo de la fuerza necesaria para superar la resistencia en la realización de la conexión de la técnica anterior.

La figura 4b es un grado de la fuerza necesaria para superar la resistencia en la realización de la conexión de la invención.

La figura 4c es un grado de fuerzas representadas en 4a y 4b, solapadas.

DESCRIPCIÓN DE LA FORMA DE REALIZACIÓN PREFERIDA

[0021] En los presentes dibujos, una conexión de la

invención se muestra en las figuras 1, 1a y la invención se muestra más claramente en las figuras 2 y 2a. En la presente conexión, la viga principal 20, mostrada en la sección transversal, se extiende longitudinalmente en una rejilla de techo. Unos conectores 21 y 22 idénticos han sido insertados a través de una ranura 23 en el alma 25 de la viga principal 20 y han sido interconectados. Los conectores 21 y 22 se conectan, respectivamente, a vigas transversales 26 y 27 por medio de remaches en 28, En la conexión, se produce lo siguiente:

(1) El extremo 30 del conector 21 se acopla con el retén 31 para formar una conexión de conector-a-conector, tal como el extremo 32 del conector 22 se acopla con el retén 33;

(2) Los enganches de bloqueo 40 en el conector 21 y el conector 22 están en una posición no flexionada;

(3) Unos topes traseros 35 y 36 sobre los conectores 21 y 22 aseguran los extremos 30 y 32 en el bloqueo de conector-a-conector;

(4) Los conectores 21 y 22 se mantienen lateralmente y verticalmente restringidos dentro de la ranura 23 por la configuración de la sección transversal de los conectores, como se conoce bien en la técnica.

[0022] La configuración general como se ha descrito hasta ahora es conforme con la técnica anterior.

[0023] En la realización de la conexión mostrada en las figuras 1 y 1a, y en las patentes citadas, un primer

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conector, o bien el conector 21 ó 22, ambos son idénticos es empujado o insertado a través de la ranura 23 de la manera de la técnica anterior. En esta explicación, se supondrá que el conector 21 es empujado primero a través de la ranura.

[0024] El enganche de bloqueo 40 entra en contacto con el lado de la ranura 23 y es flexionado suficientemente para permitir que el enganche 40 pase a través de la ranura 23 y se doble hacia atrás hasta una posición de reposo, en un movimiento unidireccional. En esta posición, el primer conector 21 a través de la ranura es retenido dentro de la ranura 23.

[0025] El segundo conector 22 es empujado entonces a través de la ranura 23 a lo largo del lateral del primer conector 21 a través de la ranura 23. De nuevo, el enganche de bloqueo 40 entra en contacto con el lado de la ranura 23, pero ahora existe menos espacio en la ranura debido a que ya ha sido insertado un conector. El segundo conector 22 en la ranura es empujado a través de la ranura 23, flexiona el enganche 40 hacia una posición cerrada, hasta que el enganche pasa a través de la ranura después de lo cual se dobla abierto hasta una posición de reposo. Los conectores 21 y 22 forman también un bloqueo de conector-a-conector en este punto, como se ve en la figura 1, donde los retenes 31 y 33 y los extremos de las vigas 30 y 32 han flexionado y luego han reflexionado hasta una posición bloqueada, en reposo.

[0026] En estas conexiones de inserción, a medida que el segundo conector en la ranura, por ejemplo el conector 22, se desplaza a través de la ranura 23 hasta una posición asentada, después de que el primer conector 21 ha sido insertado en la ranura, tiene lugar lo siguiente:

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(1) El segundo conector 22 es ajustado verticalmente dentro de la ranura 23.

(2) El segundo conector 22 es forzado lateralmente por un lado de la ranura 23 contra el primer conector 21.

(3) El enganche de bloqueo 40 sobre el segundo conector 22 es flexionado hacia una posición cerrada por un lado de la ranura 23 hasta que el enganche 40 pasa a través de la ranura 23, y luego se abre por resorte hasta una posición de reposo, como se ve por ejemplo en la figura 1.

(4) Los retenes de bloqueo 31 y 33 y los extremos de los conectores 30 y 32 sobre el primero y segundo conectores 21 y 22 se separan por flexión a medida que contactan uno con el otro, y luego se doblan de nuevo en una posición de bloqueo.

[0027] En la técnica anterior, los puntos (1) a (4) anteriores se solapan o se producen virtualmente al mismo tiempo, de manera que la fuerza y el trabajo requerido para completar una conexión 10 no sólo era la suma de las fuerzas necesarias para superar la suma de las resistencias individuales creadas por (1), (2), (3) y (4) referidas anteriormente, sino también la fuerza y el trabajo para superar la fricción creada cuando se solapan las fuerzas (1), (2), (3) y (4), o se producen al mismo tiempo. Estas resistencias a la fricción incluían:

a. La fricción entre el enganche 40 sobre el segundo conector 22 y el lado de la ranura 23 a medida que el segundo conector 22 se coloca

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verticalmente en la ranura 23.

b. La fricción lateralmente entre la base de los conectores 21 y 22.

c. La fricción entre la parte superior y la parte inferior del segundo conector 22 y la parte superior o la parte inferior de la ranura 23 a medida que el segundo conector 22 se coloca verticalmente dentro de la ranura 23.

d. La fricción entre los retenes 31 y 33 y los extremos 30 y 32 sobre el primer conector 21 dentro de la ranura y el segundo conector 22 dentro de la ranura 23 a medida que el segundo conector 22 se coloca verticalmente dentro de la ranura 23.

[0028] En la técnica anterior, en un intento por reducir la fuerza total y el trabajo total requeridos, el chaflán 37 o pendiente sobre el borde delantero de un conector 15 de la técnica anterior, como se ve en la figura 3, se realizan con una inclinación gradual, de manera que las fuerzas de fricción podrían extenderse a través de toda la longitud de la inserción, a medida que el segundo conector en la ranura 23 está siendo ajustado verticalmente.

[0029] La presente invención reduce sustancialmente la fuerza necesaria para superar la resistencia procedente de las fricciones (a), (b), (c) y (d) indicadas anteriormente y las fuerzas necesarias indicadas en (3) anteriormente para flexionar el enganche de bloqueo 40 de la invención hacia una posición cerrada, y las indicadas

en (4) anteriormente para flexionar los retenes 31 y 33 y los extremos 30 y 32 unos con relación a los otros para crear el interbloqueo de conector-a-conector.

[0030] Como en la técnica anterior, en la presente invención el enganche de resorte de lámina 40 en voladizo se forma también, tal como por estampación, a partir de la base del conector 39, como se ve, por ejemplo, en las figuras 2 y 2a. El enganche de la técnica anterior, designado con 10 en las figuras 3 y 3a, está en forma de una palanca recta 11, pivotada en 12. Forma un ángulo agudo cerrado con la base 13 del conector 15 de la técnica anterior.

[0031] En la presente invención, el enganche de la invención 40, como se ve en las figuras 2 y 2a, se forma a partir de la base 41 con un radio 42, por ejemplo de 0,1 cm (0,04 pulgadas), antes de extenderse en forma de palanca recta. La porción recta 43 del enganche de la invención 40 forma un ángulo de aproximadamente 42° con la base 41. Tal curva en el enganche de bloqueo 40 incrementa la distancia 46 con que el segundo conector 21 ó 22 entre dentro de la ranura 23 antes de que entre en contacto con el lado de la ranura 23 en 47 para crear una resistencia desde tal enganche de la invención 40 contra el lado de la ranura 23. Tal enganche de bloqueo curvado de la invención 40 reduce también la distancia 48 con el que enganche de la invención 40 está en contacto con el lado de la ranura 23 a medida que es flexionado hacia una posición cerrada a medida que pasa a través de la ranura 23, puesto que contacta con el enganche 40 más cerca del extremo del enganche que lo hacía el enganche recto 10 de la técnica anterior.

[0032] Las dimensiones representativas para el enganche

de boqueo 40 de la invención se muestran en la figura 2a.

[0033] Además, el primer contacto del enganche de la invención 40 con el lado de la ranura 23 está más allá del punto 51 del enganche de la invención 40, donde se une sobre la base 41, puesto que una porción de la parte curvada del enganche de la invención 40 se extiende en el plano de la base 41 y no se expone en contacto con el lado de la ranura 23. El punto 51 es el inicio de corte y el inicio de flexión del enganche 40 de la invención, como se ve en la figura 2a.

[0034] Por lo tanto, la fuerza ejercida por el lado de la ranura 23 a medida que el enganche 40 de la invención pasa a través de la ranura se aplica más allá del punto de pivote 51 que en la técnica anterior, por lo que se requiere menos fuerza para pivotar el enganche 40 de la invención que en el enganche de palanca recta 10 de la técnica anterior, puesto que la fuerza tiene un brazo de palanca mayor en el enganche 40 de la invención cuando se encuentra con el lado de la ranura 23 que cuando se empuja dentro de la conexión.

[0035] Por lo tanto, se requiere menos fuerza sobre una distancia más corta para aplastar el enganche 40 de la invención que la requerida para aplastar el enganche 10 en la técnica anterior. Esto da como resultado que se requiere un trabajo sustancialmente menor para realizar una conexión. Este efecto beneficioso en una conexión se multiplica por las muchas conexiones requeridas en la formación de una rejilla de techo para un techo suspendido.

[0036] En la conexión mejorada por la presente invención, durante el tiempo en el que el conector está siendo

insertado, es necesario ajustar el conector verticalmente, para que cuando está totalmente insertado, el conector ajuste verticalmente dentro de la ranura 23.

[0037] Puesto que la fuerza necesaria para aplastar el enganche 10 en la técnica anterior era sustancial, y procedía cerca del borde delantero del conector, el chaflán que guiaba el conector verticalmente hasta su posición totalmente asentada, para que el conector estuviera en posición verticalmente cuando estaba totalmente insertado, era gradual, para limitar la resistencia añadida en cualquier punto de la inserción.

[0038] Por lo tanto, incluso cuando se estaba creando el interbloqueo de conector-a-conector, en el que los retenes eran flexionados, el conector estaba siendo ajustado todavía verticalmente, teniendo en cuenta la necesidad de realizar el chaflán gradual en lugar de brusco, creando de esta manera todavía más resistencia.

[0039] En la presente invención, el cono 38 en el borde delantero del conector 21, 22 está realizado relativamente brusco, en un ángulo más empinado, de manera que se realiza un ajuste relativo inmediato verticalmente con respecto al conector a medida que es insertado en la ranura 23. Aunque un ajuste inmediato más empinado requeriría normalmente una inserción mayor que en el caso de una inserción gradual, se requiere menos en lugar de más fuerza. Esta reducción de la fuerza se obtiene por el contacto retrasado del enganche de bloqueo 40 de la invención con el lado de la ranura 23, puesto que no existe virtualmente ninguna resistencia desde el enganche de bloqueo 40 de la invención.

[0040] Se consigue una ventaja mayor por medio de la

colocación temprana vertical del conector dentro de la ranura 23 durante la inserción. A medida que los retenes 31 y 33 y los extremos 30 y 32 del primero y segundo conectores 20 y 21 de la invención entran en contacto, los retenes y los extremos están en una posición relativa entre sí, verticalmente, donde existe menos resistencia a la flexión de estos elementos lateralmente en la posición de bloqueo. Mientras que en la técnica anterior, el contacto se realizaba entre retenes y extremos, y se ejercía una fuerza entre estos elementos, fuera del centro de su posición más flexible, la fuerza requerida para flexionar los retenes y extremos era de nuevo sustancial.

[0041] Las figuras 3 y 3a muestran un conector de la técnica anterior, mientras que las figuras 2 y 2a muestran un conector de bloqueo de la presente invención.

[0042] Como se ve en las figuras 3 y 3a, el enganche 10 de la técnica anterior en forma de una palanca recta 11, es pivotada en un ángulo agudo con respecto a la base 13 de un conector de la técnica anterior 15. La línea de puntos 17 representa, en la porción ampliada, el lado de la ranura 23 a medida que el conector 15 de la técnica anterior es insertado en la ranura 23. El conector 15 de la técnica anterior recorre la distancia en 16 antes de que se encuentre con el lado de la ranura en 19, que está a una distancia 18 desde el extremo del enganche 10 de la técnica anterior.

[0043] En las figuras 2 y 2a, se muestra el conector de la invención 22, que es idéntico al conector 21 de la invención, con el enganche 40 de la invención. De nuevo, como en la figura 3a, la línea de puntos 17 en la porción ampliada representa el lado de la ranura 23 a medida que

el conector 22 es insertado en la ranura 23. El conector 22 recorre la distancia 48 antes de encontrarse con el lado de la ranura 23 en 47. Ésta es una distancia 48 desde el extremo del enganche 40 de la invención.

[0044] Las ventajas de la presente invención sobre la técnica anterior muestran gráficamente en las figuras 4a, 4b y 4c.

[0045] La figura 4, que incluye las figuras 4a, 4b y 4c, muestra las resistencias encontradas en una conexión de la técnica anterior comparadas con las fuerzas encontradas en conexión con el conector mejorado de la invención.

[0046] En la técnica anterior, la línea desde 80 hasta 81 representa la resistencia encontrada durante la inserción inicial del segundo conector en la ranura, mientras que el enganche 10 está siendo flexionado desde su contacto inicial con el lado de la ranura 23, hasta que la resistencia alcanza su máximo aproximadamente a 27 libras en el punto 81.

[0047] El contacto de la palanca recta 11 del enganche 10 de la técnica anterior es relativamente estrecho con e pivote 12 durante este recorrido. En 81, existe una caída de la resistencia durante el recorrido hasta el punto 82 hasta aproximadamente 10 libras. El enganche de palanca recta 10 de la técnica anterior durante esta caída contacta con el lado de la ranura 23 adicionalmente a lo largo de su palanca recta 11, a medida que se desplaza a través de la ranura 23, de maneras que se requiere menos fuerza, puesto que el brazo de palanca es más largo que en el contacto inicial.

[0048] En 82 existe de nuevo una elevación de la resistencia debido ala flexión de los retenes 31 y 33 y los extremos de los conectores 30 y 32 mientras forman un bloqueo de conector-a-conector. La resistencia se eleva hasta el punto 83, en cuyo punto se completa el bloqueo de conector-a-conector, y todos los elementos han flexionado hasta una posición de reposo sin resistencia adicional o sin que se produzca ningún movimiento adicional.

[0049] Las fuerzas requeridas para superar la resistencia encontrada en la realización de la conexión con la mejora de la invención se muestran gráficamente en la figura 4a. El mismo movimiento del segundo conector 22 en la ranura 23, que tiene el enganche de la invención 40, que se ha mostrado con el conector de la técnica anterior, se muestra en la figura 4a. El contacto inicial con el lado de la ranura 23 se produce en 90 y se eleva hasta 91, donde existe una resistencia de aproximadamentre 14 libras. Esta es una caída muy pequeña en la resistencia a medida que el enganche 40 de la invención pasa a través de la ranura. La resistencia se eleva entonces hasta el punto 93 hasta aproximadamente 16 libras, mientras se está formando el bloqueo de conector-a-conector a medida que se doblan los retenes 31 y 33 y los extremos de los conectores 30 y 32, después de lo cual se produce una caída en el punto 94, cuando se forman todos los extremos de resistencia después del bloqueo de conector-a-conector.

[0050] La fuerza necesaria y la distancia sobre la que debe aplicarse la fuerza son, evidentemente, considerablemente menores, en la realización de la conexión, con el conector de bloqueo de la presente invención.

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[0051] La figura 4c solapa los grafos de las figuras 4a y 4b con la posición bloqueada de la conexión de la técnica anterior, y la conexión de la invención como un punto común solapado a lo largo del eje horizontal en 96. ΔX en los grafos representa la distancia del retraso en el contacto entre el enganche 15 de la técnica anterior y el enganche 40 de la invención con el lado 17 de la ranura 23, a medida que se inserta el segundo conector en la ranura. De nuevo la figura 4c representa en forma de grafo la reducción sustancial de la fuerza y el trabajo necesarios para realizar la presente conexión con respecto a los que se requieren para realizar la conexión de la técnica anterior.

REIVINDICACIONES

1.- Un conector de bloqueo (21, 22) para una rejilla de techo suspendido, que comprende una viga principal (20) y vigas transversales (26, 27),

- en el que el conector de bloqueo (21) está diseñado para ser insertado a través de una ranura (23) en la viga principal (20) para bloqueo con un conector de bloqueo (22) opuesto idéntico ya presente en la ranura (23) y tiene un enganche de bloqueo (40) en voladizo que es integral con y está pivotado desde una base (41) en el conector de bloqueo (21), y
- en el que cuando el conector de bloqueo (21, 22) está insertado a través de la ranura (23) en la viga principal (20), el enganche de bloqueo (40) puede ser forzado por un lado de la ranura (23) a flexionar hacia la base (41) para permitir que el enganche de bloqueo (40) pase a través de la ranura (23) y cuando el conector de bloqueo (21, 22) ha siso insertado a través de la ranura (23), el enganche de bloqueo (40) puede flexionar hacia atrás hasta su posición relajada, en la que es pivotado fuera de la base (41),

caracterizado porque el enganche de bloqueo (40) está formado con una porción curvada antes de extenderse en forma de palanca recta.

2.- El conector de bloqueo de acuerdo con la reivindicación 1, caracterizado porque la porción curvada forma un radio de aproximadamente ,1 cm (0,04 pulgadas).

3.- El conector de bloqueo de acuerdo con la reivindicación 1, caracterizado porque el enganche de bloqueo (40) tiene una porción recta (43) que forma un

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ángulo de aproximadamente 42° con la base (41).

4.- El conector de bloqueo de acuerdo con la reivindicación 1, caracterizado porque está previsto un retraso en el contacto entre el lado de la ranura (23) y el enganche de bloqueo (40) cuando el conector de bloqueo (21, 22) es insertado a través de la ranura (23).

FIG. 1

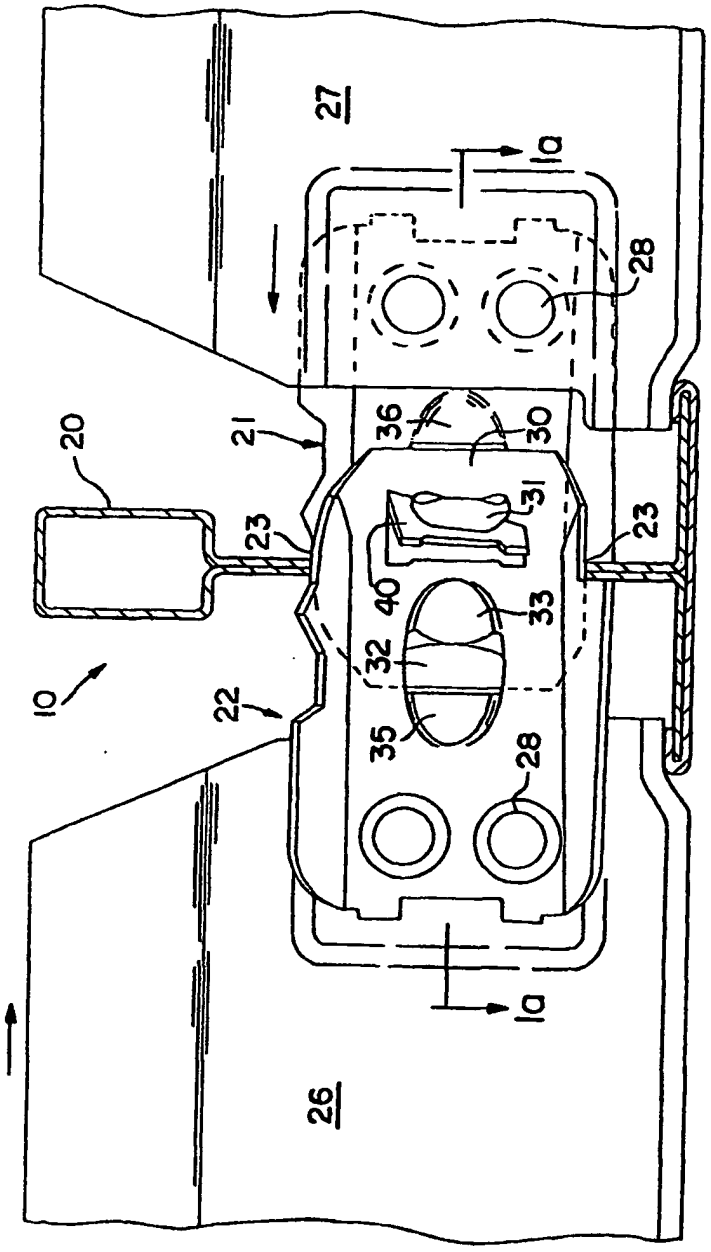
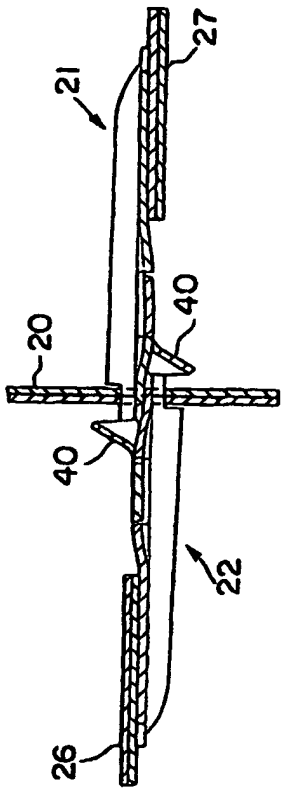


FIG. Ia



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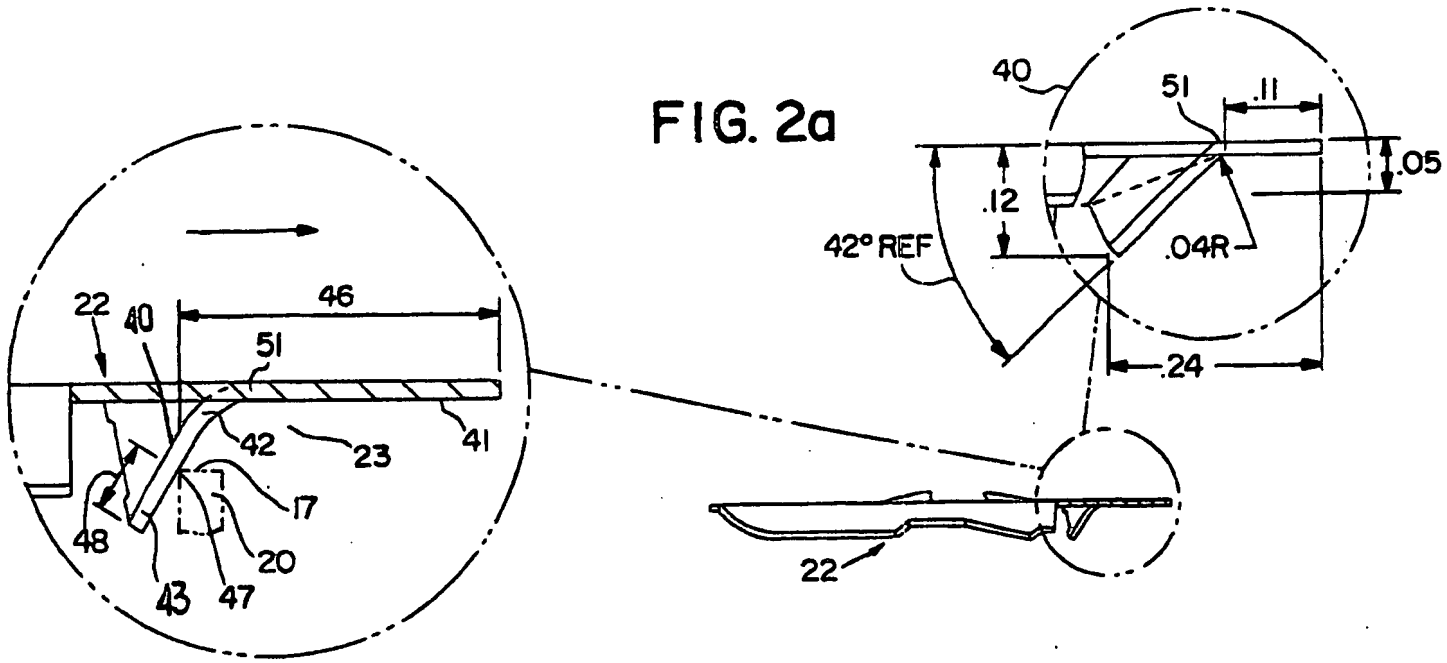

FIG. 2a

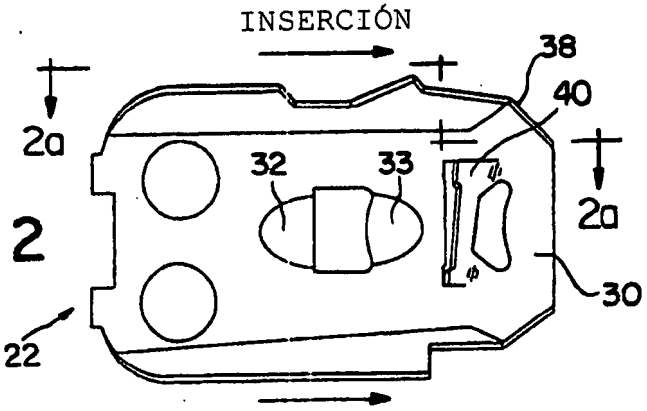

FIG. 2

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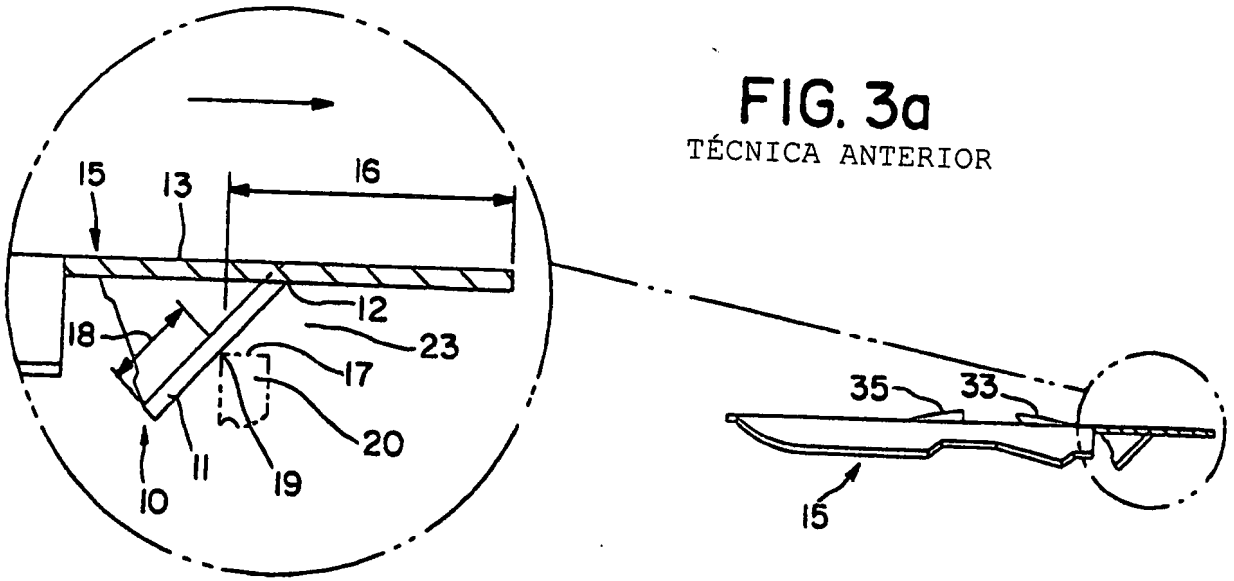

FIG. 3a
TÉCNICA ANTERIOR

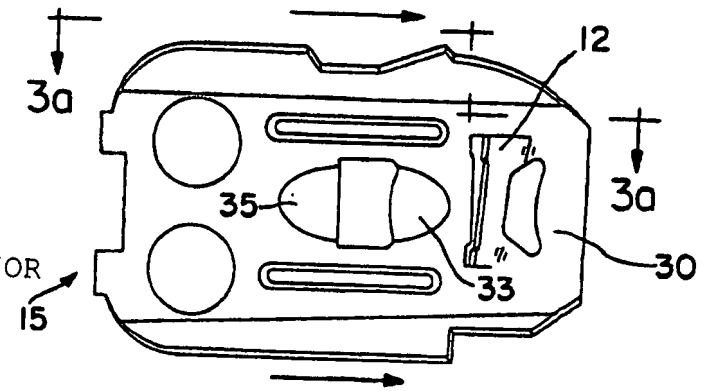

FIG. 3
TÉCNICA ANTERIOR

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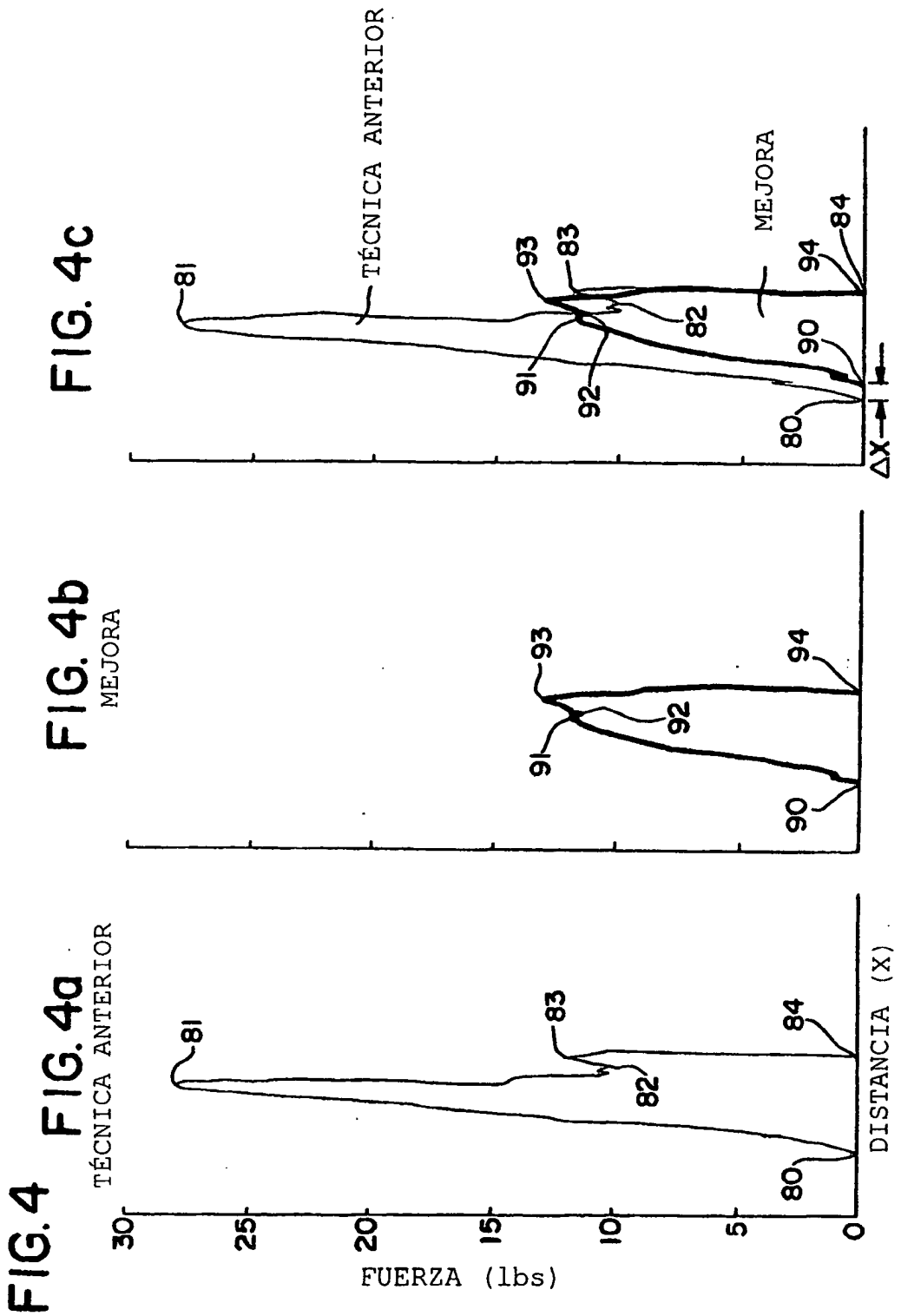
FIG. 4
FIG. 4a
TÉCNICA ANTERIOR
FIG. 4b
MEJORA
FIG. 4c
TÉCNICA ANTERIOR
MEJORA
FUERZA (lbs)
DISTANCIA (X)
30
25
20
15
10
5
0
80
81
82
83
84
90
91
92
93
94
ΔX

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Exhibit 1d

France

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BARDOU
&
MORELLE
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Conseil en Propriété Industrielle
EPA :
European Patent Attorney
ETA :
European Trademark Attorney

RCS : TOULOUSE
D 337 956 148
N° Siret : 337 956 148 000 25
Code NAF : 741A
N° TVA intracommunautaire :
FR 12 337 956 148

COPIE

Institut National de la Propriété Industrielle
Département des Titres
97 Bd Carnot

59040 LILLE CEDEX

Recommandé 1B 001 777 4149 2

Toulouse,
Le 2 Octobre 2008

RE : Partie Française du Brevet Européen No **1 553 239** au nom de **Worthington Armstrong Venture.**
N/Ref : 080910.

Mesdames, Messieurs,

Nous avons l'honneur de vous informer que le titulaire du titre référencé ci-dessus vient de nous désigner en qualité de mandataire.

Veuillez noter que la publication de la mention de la délivrance est intervenue dans le Bulletin Européen No. 08/38 en date du 17 Septembre 2008.

En conséquence, nous vous serions reconnaissant de bien vouloir envoyer, dès maintenant, toute correspondance afférente à ce titre à l'adresse suivante :

Guy MORELLE
Cabinet Morelle & Bardou, SC
BP 72253
31522 Ramonville Cedex

Par ailleurs, nous vous remercions de bien vouloir nous confirmer, par tout moyen à votre convenance, que cette prise de mandat a bien été enregistrée.

Vous souhaitant bonne réception de la présente,

Nous vous prions d'agréer, Mesdames, Messieurs, l'expression de notre considération distinguée.

Guy MORELLE
CPI 94-0504
Cabinet Morelle & Bardou, SC

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Exhibit 1e

United Kingdom (Great Britain)

Intellectual Property Office

For Creativity and Innovation

Patents Form 51

Patents Act 1977
(Rule 101)

Appointment or change of agent

(See the notes on the back of this form)

Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference	SEM/P102771GB00
2. Patent application or patent number(s) *(see note (d))*	EP (UK) No 1 553 239
3. Full name, address and postcode of the or of each person who you are authorised to act for	Worthington Armstrong Venture Suite 200, 9 Old Lincoln Highway Malvern, PA 19355 USA
Patents ADP number *(if you know it)*	
4. "Address for service" in the European Economic Area or Channel Islands to which all correspondence should be sent *(see note (e))*	BOULT WADE TENNANT VERULAM GARDENS 70 GRAY'S INN ROAD LONDON WC1X 8BT
Patents ADP number *(if you know it)*	42001
5. Have you been authorised to act in all matters relating to the above application(s) or patent(s)?	Yes
If 'no' please give details of the extent of your appointment	
6.	I/We declare that I/we have been appointed by the person(s) named in part 3 above to act as agent as stated in part 5 above
Signature	Date: 22 September 2008
7. Name, e-mail address, telephone, fax and / or mobile number, if any, of a contact point for the applicant	Mrs Jean McLeod 020 7430 7500 - Phone / 020 7430 7600 - Fax

Exhibit 1f

Italy

ALL'UFFICIO ITALIANO BREVETTI E MARCHI
via Molise, 19
ROMA

*Oggetto: Traduzione del testo del Brevetto Europeo n° **1 553 239** (Art. 56 C.P.I. 10.2.2005 n° 30)*

*La Società **Worthington Armstrong Venture,** con sede in **Malvern, PA (Stati Uniti),** tramite i Mandatari Mario Botti (Reg. n° 493 BM), Barbara Ferrari (Reg. n° 822 B), Torquato Vannini (Reg. n° 244 BM), Rinaldo Ferreccio (Reg. n° 525 BM), Umberto Zambardino (Reg. n° 862 B), Marco Zardi (Reg. n° 763 BM), Antonio Zenti (Reg. n° 1245 B), Paolo Gerli (Reg. n° 814 B), Monica Teresa Bortolan (Reg. n° 1242 B), Pietro Paglia (Reg. n° 1226 B), Riccardo Biazzi (Reg. n° 1091 B), e l'Avv. M. Caterina Spera, domiciliati presso Botti & Ferrari S.r.l. in Via Locatelli, 5 - Milano, ove elegge domicilio in Italia agli effetti di legge, ai fini previsti dal citato art. 56*

DEPOSITA PRESSO CODESTO UFFICIO

*l'allegata traduzione in lingua italiana del testo nel quale l'Ufficio Europeo dei Brevetti ha concesso/mantenuto in forma modificata il brevetto europeo rilasciato per l'Italia di cui è titolare, n° **1 553 239**, avente per titolo :"**Connettore di bloccaggio**", depositato il **11/11/2004** con domanda No. **04026847.6**, classificazione **E04B9/12.***

Timbro e firma del Mandatario

Dr. Rinaldo FERRECCIO
N. Iscriz. ALBO 525 BM

Milano, 26 novembre 2008

Allegati: *4 copie del presente formulario*
1 esemplare della traduzione
*Disegni **(No. 4 tavole)***
Lettera d'Incarico

==========

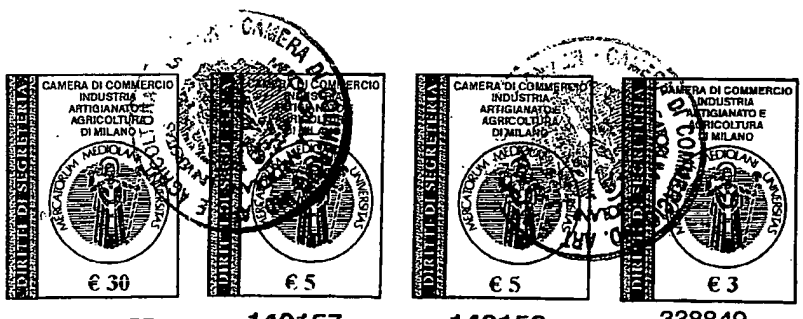
(spazio riservato all'Ufficio)
CAMERA DI COMMERCIO INDUSTRIA ARTIGIANATO E AGRICOLTURA DI MILANO

n° d'ordine 32417 BE\2008

La presente istanza con i documenti allegati è stata ricevuta da questo Ufficio in data

26 NOV. 2008

L'UFFICIALE ROGANTE
CORTONESI MAURIZIO
.....
(timbro C.C.I.A.A. e firma)



085357 140157 140158 338849

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ITALIA **ITALY** ITAD-99920.2

LETTERA D'INCARICO — POWER OF ATTORNEY

(Art. 201 C.P.I. 10.2.2005, n° 30)

IL/I sottoscritto/i

Worthington Armstrong Venture

I/We the undersigned

Worthington Armstrong Venture

Domiciliato/i

Malvern, PA (Stati Uniti)

Domiciled at

Suite 200, 9 Old Lincoln Highway
Malvern, PA 19355, U.S.A.

Nomina/no

hereby appoints

Pietro Paglia (1226B)

I Signori/Messrs. Mario Botti (Reg. no. 493 BM), Barbara Ferrari (Reg. no. 822 B), Torquato Vannini (Reg. no. 244 BM), Rinaldo Ferreccio (Reg. no. 525 BM), Umberto Zambardino (Reg. no. 862 B), Marco Zardi (Reg. no. 763 BM)
~~Alberto Gasparini (Reg. no. 474 BM), Carmela Retundo (Reg. no. 870 M),~~

Antonio Zenti (1245B), ***~~Loredana Portoghese (Reg. no. 1126 B)~~***
Paolo Gerli (814B), Monica Teresa Bortolan (1242B), Riccardo Biazzi (1091B)

*Mandatari abilitati a rappresentare dinanzi all'Ufficio Italiano Brevetti e Marchi e l'**Avv. Maria Caterina Spera**, elettivamente domiciliati presso*
BOTTI & FERRARI S.r.l. *in* Via Locatelli 5
I- 20124 Milano

*Patent and Trademark attorneys and **Maria Caterina Spera (Attorney at Law)**, domiciled at the address of*
BOTTI & FERRARI S.r.l.

come propri mandatari, anche in via disgiuntiva e con facoltà di nominare sostituti, per depositare in Italia presso l'Ufficio Italiano Brevetti e Marchi o presso altri Uffici competenti la traduzione del testo del brevetto europeo n. 1 553 239 dal titolo "Connettore di bloccaggio"

as Attorneys of the undersigned, even disjointedly and with authority to appoint substitutes, in order to file in Italy at the Italian Patents and Trademarks Office or all other qualified Authorities

EP 1 553 239, validation in Italy

e per fare quanto altro necessario o utile per il suo accoglimento e per il riconoscimento dei diritti e delle facoltà che ne derivano nei rapporti con l'Ufficio Italiano Brevetti e Marchi e con altri Uffici competenti, in particolare presentare documenti, pagare tasse, richiedere riscuotere rimborsi, richiedere certificati e copie autentiche, ritirare attestati, modificare e ritirare domande, documenti e brevetti concessi, dichiarare traduzioni conformi, presentare risposte e controdeduzioni a richieste e/o rilievi, presentare e documentare ricorsi alla Commissione dei Ricorsi, presentare domande di annotazione e/o trascrizione e istanze di limitazione.

and to do whatever may be necessary or useful to have the application accepted and for the acknowledgement of the rights and powers deriving therefrom before the Italian Patents and Trademarks Office and other competent offices, in particular for the filing of documents, payment of taxes, requests and cashing of refunds, requests of certificates and certified copies, receiving the Letters Patent and registration certificates, amending or withdrawing applications, related documents and patents, declaring true translations, filing responses and arguments to official requirements and/or objections, filing and arguing appeals in front of the "Commissione dei Ricorsi", applying for changes recording and filing petitions for limitation.

A tale scopo il/i sottoscritto/i elegge/eleggono domicilio presso detti mandatari ai quali chiede/chiedono che vengano fatte direttamente dall'Ufficio Italiano Brevetti e Marchi o dagli altri Uffici competenti tutte le comunicazioni, nonché tutte le richieste e consegne di documenti che si rendessero necessarie, anche ai sensi e per gli effetti dell'Art. 120 C.P.I. 10.2.2005, n° 30

To this purpose, I/We the undersigned, elect domicile with the aforesaid representatives, to whom I/We request that the Italian Patent and Trade Mark Office and all other qualified Authorities direct all communications, requests and deliveries of documents which may be necessary, also pursuant to the last paragraphs of Art. 120 C.P.I. dated 10.2.2005, n° 30.

Il mandatario.
Dr. Rinaldo FERRECCIO
N. Iscriz. ALBO 525 BM

Signature and date:
firma e data:

William J. Platt
Vice President-Engineering
Worthington Armstrong Venture

June 16, 2008
Date

No Legalisation Required
Nessuna Legalizzazione

MARCA DA BOLLO
Ministero dell'Economia e delle Finanze
€14,62
Agenzia Entrate
0 1 07 145811 560 2

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Traduzione del testo del brevetto europeo n° **1 553 239**

Titolare: **Worthington Armstrong Venture**

Titolo: **"Connettore di bloccaggio"**

* * * * *

DESCRIZIONE

STATO DELL'ARTE DELL'INVENZIONE

I controsoffitti sono usati ampiamente in edifici commerciali e industriali. In tali soffitti una struttura di griglia metallica di travi principali e travi traverse interconnesse è appesa a un soffitto strutturale mediante cavi. La griglia supporta pannelli acustici, in aperture rettangolari formate nella griglia.

Questa invenzione si riferisce a connettori di bloccaggio usati nel la griglia per giuntare una coppia di travi traverse opposte e una trave principale su intersezioni della griglia.

Controsoffitti aventi travi metalliche interconnesse in una griglia che supporta pannelli sono ben noti (ad esempio dai documenti U.S. 5,839,246 o US 6,178,712).

La griglia in tali soffitti presenta, a ogni intersezione di griglia, una coppia di travi traverse opposte e una trave principale che formano una connessione.

Ogni trave traversa in una tale connessione ha un connettore alla propria estremità che è spinto, o conficcato, da lati opposti della trave principale, attraverso una fessura nella trave principale. I connettori sono tutti identici.

Si impedisce che il connettore che è inserito per primo nella

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fessura venga riestratto dalla fessura mediante il dispositivo di arresto a sbalzo nel connettore, sotto forma di una molla a balestra flessibile oscillante. Tale dispositivo di arresto, il quale è solidale alla base del connettore e formato a partire da essa mediante punzonatura, è spinto verso una posizione aperta. Il dispositivo di arresto, il quale è realizzato a sbalzo ad angolo dalla base del connettore, si flette verso una posizione chiusa in conseguenza del vincolo dato dal lato della fessura, quando il connettore è conficcato attraverso la fessura per realizzare la connessione, ma poi ritorna flettendosi alla propria posizione di riposo spinta per impedire che il connettore venga riestratto dalla fessura.

Un altro connettore su una trave traversa opposta, identico al primo connettore spinto attraverso la fessura, è quindi conficcato attraverso la fessura nello spazio ridotto nella fessura a fianco del primo. Il dispositivo di bloccaggio sul connettore viene a contatto con il lato della fessura vicino al perno del dispositivo di bloccaggio, e viene flesso verso una posizione chiusa.

In particolare, inserendo il secondo connettore nella fessura, con un movimento che lo conficca in modo lineare, sostanzialmente si necessita di sostanziali lavoro e forza per realizzare la connessione.

Tale resistenza si presenta di fatto immediatamente quando il secondo connettore nella fessura entra nella fessura, e continua lungo tutto il percorso del connettore fino a che esso è alloggiato in una posizione bloccata, come descritto in seguito, con il primo connettore nella fessura.

Entrambi i connettori si interconnettono quando il secondo

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connettore nella fessura è completamente inserito. Denti di arresto formati dalla base del connettore, in forma di bulbi, che hanno un lato a camma e un lato di bloccaggio, e le estremità dei connettori, si flettono e si ri-flettono per impegnarsi in ciò che viene comunemente definito dispositivo di bloccaggio connettore-connettore, o bloccaggio "handshake". Un tale collegamento "handshake" tra i connettori impedisce che i connettori siano smontati linearmente estraendoli dalla fessura. I connettori sono tenuti lateralmente e verticalmente insieme dalla fessura nella trave principale.

Nella posizione bloccata in sede, il secondo connettore è allineato orizzontalmente con il primo connettore entro i confini della fessura, di modo che i denti di arresto sui connettori sono impegnati e ritenuti allo stesso livello per formare il bloccaggio connettore-connettore. Generalmente, il secondo connettore deve essere o alzato o abbassato quando passa nella fessura per ottenere un tale allineamento orizzontale. Pertanto il profilo del bordo di attacco del connettore è rastremato per guidare il connettore durante il proprio percorso attraverso la fessura della trave principale.

Tali connettori di tipi generico sono divulgati, ad esempio, in U.S. 5,839,246 o U.S. 4,317,641. Tale arte antecedente si riferisce a un connettore di bloccaggio per una griglia di controsoffitto come quella descritta nel preambolo della rivendicazione 1.

SOMMARIO DELLA PRESENTE INVENZIONE

L'obiettivo della presente invenzione è quello di fornire un connettore di bloccaggio che richieda minore forza e minore lavoro per

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eseguire la connessione.

Vi è una minore necessità di lavoro e di forza per il fatto che, nell'inserimento del secondo connettore nell'area ridotta della fessura della trave principale, (1) vi è un ritardo nel contatto tra il dispositivo di bloccaggio e il lato della fessura, di modo che durante il ritardo (2) elementi nella connessione conseguente sono posizionati offrendo contemporaneamente la minima resistenza da parte delle forze di attrito a tale posizionamento, e (3) quando avviene il contatto tra elementi, gli elementi sono posizionati in modo da offrire la minima resistenza alla realizzazione di una connessione.

Per ottenere quanto sopra il dispositivo di bloccaggio, nella propria posizione non flessa, deve estendersi lateralmente di una misura sufficiente al di fuori della base del connettore per impedire che il primo connettore sia estratto attraverso la fessura prima che venga inserito il secondo connettore, ed è formato con una parte curva prima di estendersi a guisa di leva diritta.

Ciò, come esposto sopra al punto (1), ritarda il contatto tra il dispositivo di bloccaggio e il lato della fessura, quando il secondo connettore è inserito nella fessura e, come esposto sopra al punto (2), tale contatto è realizzato ulteriormente lungo il dispositivo di bloccaggio dal punto di oscillazione più vicino all'estremità del dispositivo di bloccaggio, creando un braccio di leva più lungo, di modo che è necessaria meno forza per chiudere il dispositivo di bloccaggio.

L'estremità del dispositivo di bloccaggio rivolta verso l'esterno in una posizione non flessa si estende fino alla stessa posizione del

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dispositivo di bloccaggio diritto dell'arte antecedente, ruotato di un angolo acuto. Tale posizione è necessaria affinché il connettore non possa essere ritratto dopo che il dispositivo di bloccaggio passa attraverso la fessura.

Inoltre, durante il ritardo nel punto (1) di cui sopra, il secondo connettore nella fessura viene posizionato verticalmente dalla rastremazione sull'estremità di attacco del connettore, che si impegna con la sommità o col fondo della fessura, allo stesso livello orizzontale del primo connettore, senza la resistenza di attrito creata nella connessione dell'arte antecedente, dove il dispositivo di bloccaggio, di fatto immediatamente, forza lateralmente insieme la prima e la seconda connessione.

Regolando il secondo connettore nella fessura più rapidamente verticalmente mentre esso si muove attraverso la fessura, i denti di arresto e le estremità del connettore che si impegnano insieme mediante flessione si trovano in una posizione, come esposto sopra al punto (3) tale da offrire la minima resistenza a tale impegno.

BREVE DESCRIZIONE DEI DISEGNI

La figura 1 è una vista in elevazione laterale destra di una connessione di due travi traverse attraverso una fessura nella trave principale, illustrante i connettori dell'invenzione impegnati in un bloccaggio connettore-connettore.

La figura 2 è una vista in elevazione laterale destra del connettore dell'invenzione, illustrato nella connessione di figura 1.

La figura 2a è una vista in sezione dall'alto del connettore

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dell'invenzione, presa lungo la linea A-A di figura 2, con una parte ingrandita cerchiata illustrante il dispositivo di bloccaggio dell'invenzione.

Le figure 3 e 3a sono viste di un'arte antecedente corrispondente alle viste delle figure 2 e 2a.

La figura 3 è una vista in elevazione laterale di un connettore dell'arte antecedente.

La figura 3a è una vista in sezione dall'alto di un connettore dell'arte antecedente presa lungo la linea A-A di figura 3, con una parte cerchiata ingrandita illustrante un dispositivo di bloccaggio dell'arte antecedente.

La figura 4 è un gruppo di grafici, 4a, 4b, e 4c che rappresentano le forze coinvolte nella realizzazione di un connessione.

La figura 4a è un grafico della forza necessaria a superare la resistenza nel realizzare la connessione dell'arte antecedente.

La figura 4b è un grafico della forza necessaria a superare la resistenza nel realizzare la connessione dell'invenzione.

La figura 4c è un grafico delle forze rappresentate nelle figure 4a e 4b, sovrapposte.

DESCRIZIONE DELLE FORME DI REALIZZAZIONE PREFERITE

Nei presenti disegni una connessione secondo l'invenzione è illustrata nelle figure 1, 1a e l'invenzione è illustrata più chiaramente nelle figure 2 e 2a. Nella presente connessione la traversa principale 20,

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illustrata in sezione trasversale, si estende longitudinalmente in una griglia di soffitto. Connettori identici 21 e 22 sono stati conficcati attraverso una fessura 23 nel gambo 25 della trave principale 20 e si interconnettono. I connettori 21 e 22 sono collegati rispettivamente a travi traverse 26 e 27 mediante rivetti 28.

Nella connessione avviene quanto segue:

(1) L'estremità 30 del connettore 21 si impegna con il dente di arresto 31 per formare una connessione connettore-connettore, e allo stesso modo l'estremità 32 del connettore 22 si impegna con il dente di arresto 33;

(2) I dispositivi di bloccaggio 40 su connettore 21 e connettore 22 sono in una posizione non flessa;

(3) Fermi antiritorno 35 e 36 sui connettori 21 e 22 assicurano le estremità 30 e 32 nel bloccaggio connettore-connettore;

e

(4) I connettori 21 e 22 sono tenuti lateralmente e verticalmente vincolati entro la fessura 23 dalla configurazione di sezione trasversale dei connettori, come ben noto nell'arte.

La configurazione generale decritta fin qui è conforme all'arte antecedente.

Nel realizzare la connessione illustrata nelle figure 1 e 1a, e nei brevetti citati, un primo connettore, che può essere il connettore 21 o 22, essendo i medesimi identici, è spinto o conficcato attraverso la fessura 23 nella maniera corrispondente all'arte antecedente. In questa spiegazione si assumerà che il connettore 21 sia spinto per primo

attraverso la fessura.

Il dispositivo di bloccaggio 40 entra in contatto con il lato della fessura 23 e viene flesso abbastanza da permettere al dispositivo di bloccaggio 40 di passare attraverso la fessura 23 e flettersi nuovamente ritornando a una posizione di riposo, in un movimento a senso unico. In tale posizione il primo connettore 21 attraverso la fessura è ritenuto all'interno della fessura 23.

Il secondo connettore 22 viene quindi spinto attraverso la fessura 23 a fianco del primo connettore 21 attraverso la fessura 23. Nuovamente, il dispositivo di bloccaggio 40 entra in contatto con il lato della fessura 23, ma ora vi è meno spazio nella fessura dato che è già stato inserito un connettore. Il secondo connettore 22 nella fessura, mentre è spinto attraverso la fessura 23, flette il dispositivo di bloccaggio 40 verso una posizione chiusa, fino a che il dispositivo di bloccaggio passa attraverso la fessura, dopodiché si flette aprendosi in una posizione di riposo. I connettori 21 e 22 inoltre formano a questo punto un bloccaggio tra connettore e connettore, come si vede in figura 1, in cui i denti di arresto 31 e 33 e le estremità di trave 30 e 32 sono stati flessi e poi flessi nuovamente in una posizione bloccata, di riposo.

In tali connessioni ad innesto, quando il secondo connettore nella fessura, ad esempio il connettore 22, si muove attraverso la fessura 23 in una posizione alloggiata, dopo che il primo connettore 21 è stato inserito nella fessura, avviene quanto segue:

(1) Il secondo connettore 22 è regolato verticalmente all'interno della fessura 23.

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(2) Il secondo connettore 22 è forzato lateralmente da un lato della fessura 23 contro il primo connettore 21.

(3) Il dispositivo di bloccaggio 40 sul secondo connettore 22 viene flesso verso una posizione chiusa da un lato della fessura 23 fino a che il dispositivo di bloccaggio 40 passa attraverso la fessura 23, e quindi si apre a molla in una posizione di riposo, come si può vedere ad esempio in figura 1.

(4) I denti di arresto 31 e 33 e le estremità di connettore 30 e 32 sul primo e sul secondo connettore 21 e 22 sono flessi distanziati quando entrano a contatto tra loro e poi flessi nuovamente per assumere una posizione di bloccaggio.

Nell'arte antecedente i punti da (1) a (4) di cui sopra si sovrapponevano o si verificavano di fatto in modo simultaneo, per cui la forza e il lavoro richiesti per completare una connessione 10 non erano soltanto la somma delle forze necessarie a superare la somma delle resistenze individuali create da (1), (2), (3) e (4) a cui si fa riferimento subito sopra, ma anche la forza e il lavoro necessari a superare l'attrito creato quando forze (1), (2), (3) e (4) si sovrapponevano o si presentavano simultaneamente. Tali resistenze di attrito includevano:

a. L'attrito tra il dispositivo di bloccaggio 40 sul secondo connettore 22 e il lato della fessura 23 quando il secondo connettore 22 veniva posizionato verticalmente nella fessura 23.

b. L'attrito che si verificava lateralmente tra la base dei connettori 21 e 22.

c. L'attrito tra la sommità o il fondo del secondo connettore

22 e la sommità o il fondo della fessura 23 quando il secondo connettore 22 veniva posizionato verticalmente all'interno della fessura 23.

d. L'attrito tra i denti di arresto 31 e 33 e le estremità 30 e 32 sul primo connettore 21 nella fessura e il secondo connettore 22 nella fessura 23 quando il secondo connettore 22 veniva posizionato verticalmente dentro la fessura 23.

Nell'arte antecedente, in un tentativo di ridurre la forza totale e il lavoro necessari, la rastremazione 37 o l'inclinazione sul bordo di attacco di un connettore 15 dell'arte antecedente, illustrato in figura 3, era realizzata con una inclinazione graduale, di modo che le forze di attrito potevano essere diffuse lungo tutta la lunghezza dell'inserimento, mentre il secondo connettore nella fessura 23 veniva regolato verticalmente.

La presente invenzione riduce considerevolmente la forza necessaria a superare la resistenza dovuta agli attriti (a), (b), (c) e (d) di cui sopra e le forze necessarie al punto (3) di cui sopra per flettere il dispositivo di bloccaggio 40 dell'invenzione verso una posizione chiusa, e al punto (4) di cui sopra per flettere i denti di arresto 31 e 33 e le estremità 30 e 32 gli uni rispetto alle altre per creare il bloccaggio interconnesso tra connettore e connettore.

Come nell'arte antecedente, nella presente invenzione il dispositivo di bloccaggio a molla a balestra a sbalzo 40 continua a essere formato, mediante punzonatura, dalla base del connettore 39, come si vede ad esempio nelle figure 2 e 2a. Il dispositivo di bloccaggio

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dell'arte antecedente, designato con il numero 10 come si vede nelle figure 3 e 3a, è in forma di una leva diritta 11, avente un perno di oscillazione 12. Essa forma un angolo acuto con la base 13 del connettore 15 dell'arte antecedente.

Nella presente invenzione il dispositivo di bloccaggio 40 dell'invenzione, come si vede nelle figure 2 e 2a, è formato in questo caso dalla base 41 con un raggio 42, ad esempio pari a 0,1 cm (0,04 pollici), prima di estendersi a guisa di leva diritta. La parte diritta 43 del dispositivo di bloccaggio dell'invenzione 40 forma un angolo di circa 42° con la base 41. Una tale curva nel dispositivo di bloccaggio 40 aumenta la distanza 46 con cui il secondo connettore 21 o 22 entra nella fessura 23 prima di entrare in contatto con il lato della fessura 23 nel punto 47, per creare una resistenza esercitata da tale dispositivo di bloccaggio dell'invenzione 40 contro il lato della fessura 23. Un tale dispositivo di bloccaggio curvo dell'invenzione 40 inoltre riduce la distanza 48 con cui il dispositivo di bloccaggio dell'invenzione 40 è in contatto con il lato della fessura 23 quando viene flesso verso una posizione chiusa mentre passa attraverso la fessura 23, dato che esso entra in contatto con il dispositivo di bloccaggio 40 in un punto più vicino all'estremità del dispositivo di bloccaggio rispetto al dispositivo di bloccaggio diritto 10 dell'arte antecedente.

Dimensioni rappresentative per il dispositivo di bloccaggio 40 dell'invenzione sono illustrate nella figura 2a.

Inoltre il primo contatto del dispositivo di bloccaggio dell'invenzione 40 con il lato della fessura 23 è situato più esternamente

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dal punto 51 del dispositivo di bloccaggio dell'invenzione 40 in cui esso è giuntato alla base 41, dato che una parte del tratto curvo del dispositivo di bloccaggio dell'invenzione 40 si estende nel piano della base 41 e non è esposta ad alcun contatto con il lato della fessura 23. Il punto 51 è l'avvio di taglio e l'avvio di piegatura del dispositivo di bloccaggio 40 dell'invenzione come si vede in figura 2a.

Pertanto la forza esercitata dal lato della fessura 23 quando il dispositivo di bloccaggio 40 dell'invenzione passa attraverso la fessura è esercitata ulteriormente dal punto di oscillazione 51 rispetto all'arte antecedente, richiedendo così minore forza per far oscillare il dispositivo di bloccaggio 40 dell'invenzione rispetto a quanto accadeva nel dispositivo di bloccaggio a leva diritta 10 dell'arte antecedente, dato che la forza ha un braccio di leva maggiore nel dispositivo di bloccaggio 40 dell'invenzione quando esso incontra il lato della fessura 23 mentre viene spinto nella connessione.

In tal modo è necessaria una forza minore su una distanza più breve per far collassare il dispositivo di bloccaggio 40 dell'invenzione, rispetto a quella richiesta per far collassare il dispositivo di bloccaggio 10 dell'arte antecedente. Ciò ha come risultato fondamentalmente che è necessario un lavoro sostanzialmente minore per realizzare una connessione. Tale effetto vantaggioso in una connessione si moltiplica per le numerose connessioni necessarie nel formare una griglia di soffitto in un controsoffitto.

Nella connessione migliorata dalla presente invenzione,

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durante l'intervallo di tempo in cui il connettore viene inserito, è necessario regolare il connettore verticalmente, di modo che una volta inserito completamente, il connettore si adatti verticalmente nella fessura 23.

Dato che la forza necessaria a far collassare il dispositivo di bloccaggio 10 dell'arte antecedente era considerevole, e si presentava vicino al bordo di attacco del connettore, la rastremazione che guidava il connettore verticalmente alla propria posizione completamente alloggiata di modo che il connettore fosse in posizione verticale una volta inserito completamente, era graduale, per limitare la resistenza aggiunta in ogni singolo punto nell'inserimento.

Pertanto, anche quando veniva creato il bloccaggio interconnesso tra connettore e connettore, in cui i denti di arresto si flettevano, il connettore veniva ancora regolato verticalmente in considerazione della necessità di rendere la rastremazione graduale piuttosto che brusca, creando così maggiore resistenza.

Nella presente invenzione la rastremazione 38 al bordo di attacco del connettore 21, 22 è realizzata in modo relativamente brusco, secondo un angolo più stretto, di modo che viene eseguita una regolazione relativa immediata verticalmente rispetto al connettore quando esso viene inserito nella fessura 23. Anche se una regolazione più stretta, immediata, normalmente richiederebbe una forza di inserimento maggiore di quella di un inserimento graduale, è necessaria una forza minore piuttosto che maggiore. Tale riduzione di forza è ottenuta mediante il contatto ritardato del dispositivo di bloccaggio 40

dell'invenzione con il lato della fessura 23, dato che non vi è di fatto alcuna resistenza all'avanzamento o resistenza da parte del dispositivo di bloccaggio 40 dell'invenzione.

Vi è un ulteriore beneficio che viene ottenuto con il posizionamento verticale anticipato del connettore all'interno della fessura 23 durante l'inserimento. Quando i denti di arresto 31 e 33 e le estremità 30 e 32 del primo e secondo connettore dell'invenzione 20 e 21 entrano in contatto, i denti di arresto e le estremità sono in una posizione di relazione reciproca, verticalmente, in cui vi è meno resistenza alla flessione di tali elementi lateralmente nella posizione di bloccaggio. Invece, nell'arte antecedente veniva realizzato un contatto tra denti di arresto ed estremità, e veniva esercitata forza tra tali elementi, scentrata dalla loro posizione più flessibile, e la forza richiesta per flettere denti di arresto ed estremità era nuovamente considerevole.

Le figure 3 e 3a illustrano un connettore dell'arte antecedente, mentre le figure 2 e 2a illustrano un connettore di bloccaggio della presente invenzione.

Come si vede nelle figure 3 e 3a, il dispositivo di bloccaggio 10 dell'arte antecedente in forma di leva diritta 11 è fatto oscillare con un angolo acuto rispetto alla base 13 di un connettore 15 secondo l'arte antecedente. La linea tratteggiata 17 rappresenta, nella parte ingrandita, il lato di fessura 23 quando il connettore 15 dell'arte antecedente è inserito nella fessura 23. Il connettore 15 dell'arte antecedente percorre la distanza 16 prima di incontrare il lato della fessura nel punto 19, il quale si trova a una distanza 18 dall'estremità

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del dispositivo di bloccaggio 10 secondo l'arte antecedente.

Nelle figure 2 e 2a viene illustrato il connettore dell'invenzione 22, il quale è identico al connettore dell'invenzione 21, con il dispositivo di bloccaggio 40 dell'invenzione. Come anche in figura 3a, la linea tratteggiata 17 nella parte ingrandita rappresenta il lato della fessura 23 quando il connettore 22 è inserito nella fessura 23. Il connettore 22 percorre la distanza 46 prima di incontrare il lato della fessura 23 nel punto 47. La distanza 48 è una distanza dall'estremità del dispositivo di bloccaggio 40 dell'invenzione.

I vantaggi della presente invenzione rispetto all'arte antecedente sono illustrati graficamente nelle figure 4a, 4b e 4c.

La figura 4, che include le figure 4a, 4b e 4c, illustra le resistenze che si incontrano in una connessione dell'arte antecedente a confronto con le forze incontrate in una connessione con il connettore migliorato dell'invenzione.

Nell'arte antecedente, la linea da 80 a 81 rappresenta la resistenza incontrata durante l'inserimento iniziale del secondo connettore nella fessura, mentre il dispositivo di bloccaggio 10 viene flesso dal proprio contatto iniziale con il lato della fessura 23 fino a che la resistenza raggiunge il suo valore massimo pari a circa 27 libbre al punto 81.

Il contatto della leva diritta 11 del dispositivo di bloccaggio 10 dell'arte antecedente è relativamente vicino al perno 12 durante tale percorso. In 81 vi è una diminuzione della resistenza durante il percorso fino al punto 82 pari a circa 10 libbre. Il dispositivo di

bloccaggio 10 a leva diritta dell'arte antecedente durante tale diminuzione entra in contatto con il lato della fessura 23 più esternamente lungo la propria leva diritta 11, mentre passa attraverso la fessura 23, per cui è necessaria meno forza dato che il braccio di leva è più lungo che al contatto iniziale.

In 82 vi è un nuovo aumento della resistenza dovuto alla flessione dei denti di arresto 31 e 33 e delle estremità di connettore 30 e 32 mentre stanno formando un bloccaggio tra connettore e connettore. La resistenza aumenta al punto 83, dove il bloccaggio tra connettore e connettore è completato, e tutti gli elementi si sono flessi nuovamente in una posizione di riposo senza che avvenga ulteriore resistenza o movimento.

Le forze necessarie per superare la resistenza incontrata nel realizzare una connessione con il miglioramento dell'invenzione è illustrata graficamente nella figura 4a. Lo stesso movimento del secondo connettore 22 nella fessura 23, presentante il dispositivo di bloccaggio 40 dell'invenzione è illustrato, come era illustrato con il connettore dell'arte antecedente, in figura 4a. Il contatto iniziale con il lato della fessura 23 avviene in 90 e aumenta in 91 quando vi è una resistenza di circa 14 libbre. Vi è una diminuzione molto leggera di resistenza quando il dispositivo di bloccaggio 40 dell'invenzione passa attraverso la fessura. La resistenza quindi aumenta al punto 93 a circa 16 libbre mentre il bloccaggio tra connettore e connettore viene formato quando i denti di arresto 31 e 33 e le estremità di connettore 30 e 32 si flettono, dopodiché vi è una diminuzione al punto 94, in cui la resistenza cessa

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completamente dopo che si forma il bloccaggio tra connettore e connettore.

La forza necessaria e la distanza sulla quale la forza deve essere applicata, è ovviamente considerevolmente inferiore, nel realizzare la connessione, con il connettore di bloccaggio della presente invenzione.

La figura 4c sovrappone i grafici delle figure 4a e 4b con la posizione bloccata della connessione dell'arte antecedente, e la connessione dell'invenzione come un punto comune sovrapposto lungo l'asse orizzontale in 96. ΔX nel grafico rappresenta la distanza del ritardo nel contatto tra il dispositivo di bloccaggio dell'arte antecedente 15 e il dispositivo di bloccaggio 40 dell'invenzione, con il lato 17 della fessura 23, quando il secondo connettore viene inserito nella fessura. Ancora, la figura 4c, in forma di grafico, rappresenta la riduzione considerevole di forza e lavoro necessari per realizzare la presente connessione, rispetto a quanto accadeva nel realizzare la connessione dell'arte antecedente.

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RIVENDICAZIONI

1. Connettore di bloccaggio (21, 22) per una griglia di controsoffitto, comprendente una trave principale (20) e travi traverse (26, 27),

- in cui il connettore di bloccaggio (21) è progettato per essere conficcato attraverso una fessura (23) nella trave principale (20) per bloccarsi con un connettore di bloccaggio (22) opposto identico già nella fessura (23), e ha un dispositivo di bloccaggio (40) a sbalzo solidale con, e fatto oscillare da, una base (41) nel connettore di bloccaggio (21), e

- in cui quando il connettore di bloccaggio (21, 22) è conficcato attraverso una fessura (23) nella trave principale (20), il dispositivo di bloccaggio (40) può essere forzato da un lato della fessura (23) a flettersi verso la base (41) per permettere al dispositivo di bloccaggio (40) di passare attraverso la fessura (23), e quando il connettore di bloccaggio (21, 22) è stato conficcato attraverso la fessura (23), il dispositivo di bloccaggio (40) può flettersi ritornando alla propria posizione di riposo in cui esso è fatto oscillare in allontanamento dalla base (41),

caratterizzato dal fatto che il dispositivo di bloccaggio (40) è formato con una parte curva prima di estendersi a guisa di leva diritta.

2. Il connettore di bloccaggio secondo la rivendicazione 1, caratterizzato dal fatto che la parte curva forma un raggio di circa 0,1 cm (0,04 pollici).

3. Il connettore di bloccaggio secondo la rivendicazione 1, caratterizzato dal fatto che il dispositivo di bloccaggio (40) presenta una parte diritta (43) la quale forma un angolo di circa 42° con la base (41).

4. Il connettore di bloccaggio secondo la rivendicazione 1, caratterizzato dal fatto che un ritardo nel contatto tra il lato della fessura (23) e il dispositivo di bloccaggio (40) è fornito quando il connettore di bloccaggio (21, 22) è conficcato attraverso la fessura (23).

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Per traduzione conforme all'originale.

Dr. Rinaldo FERRECCIO
N. Iscriz. ALBO 525 BM

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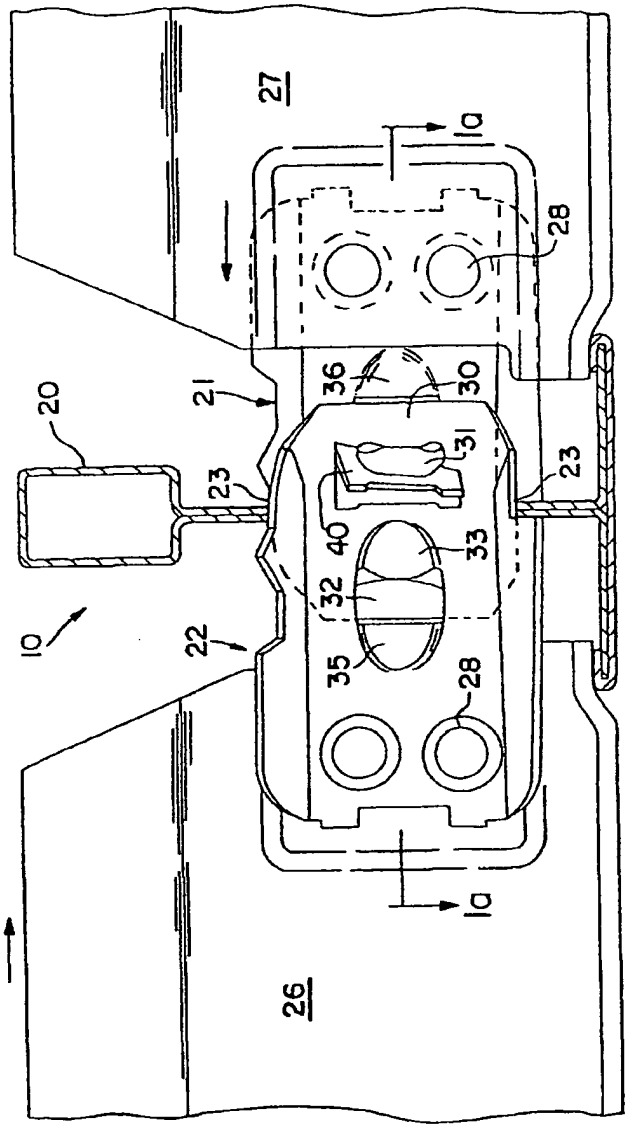
FIG. 1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Ia
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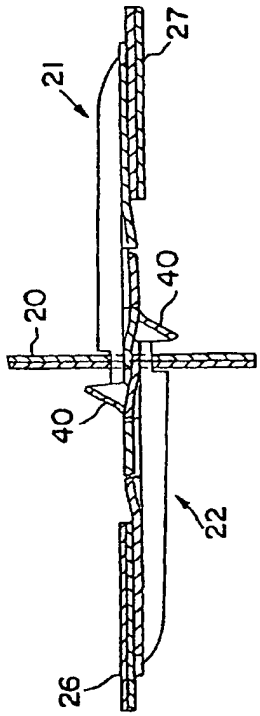
FIG. Ia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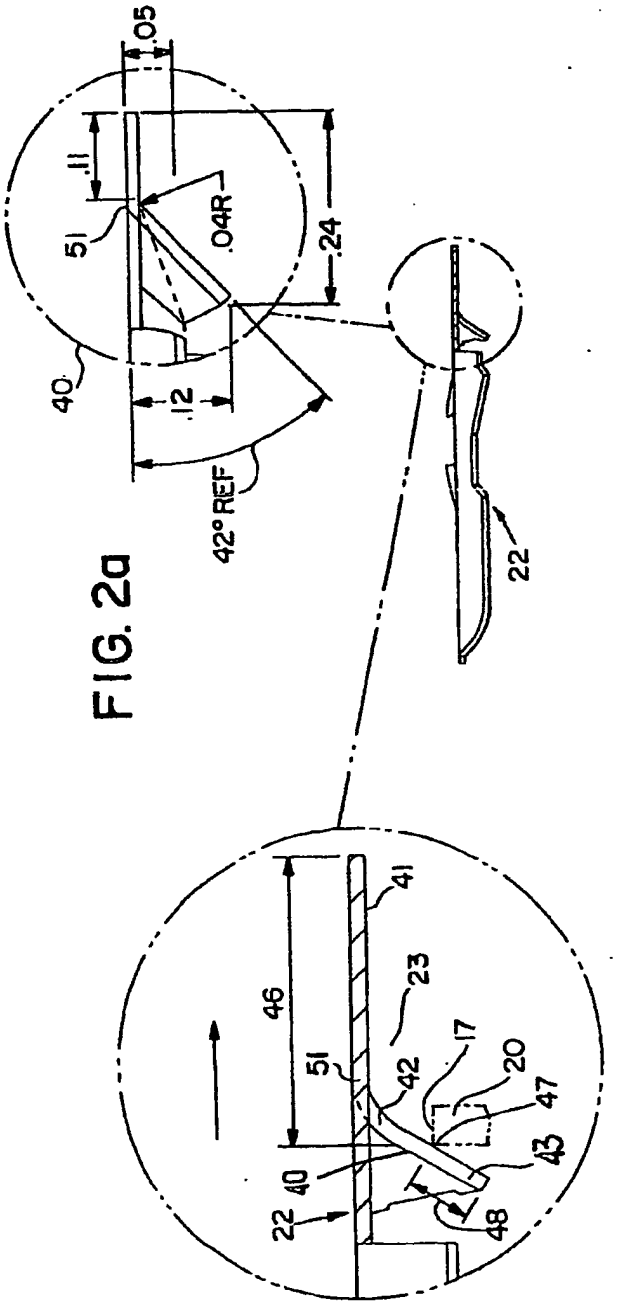

FIG. 2a

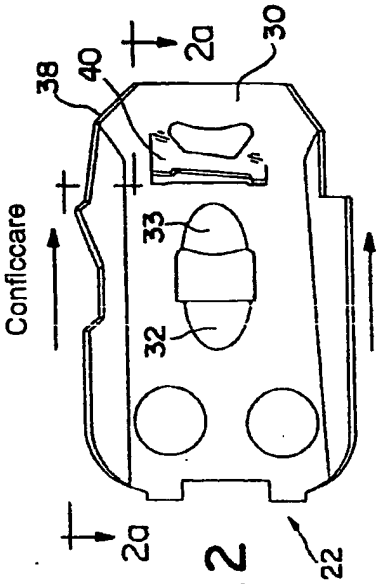

FIG. 2

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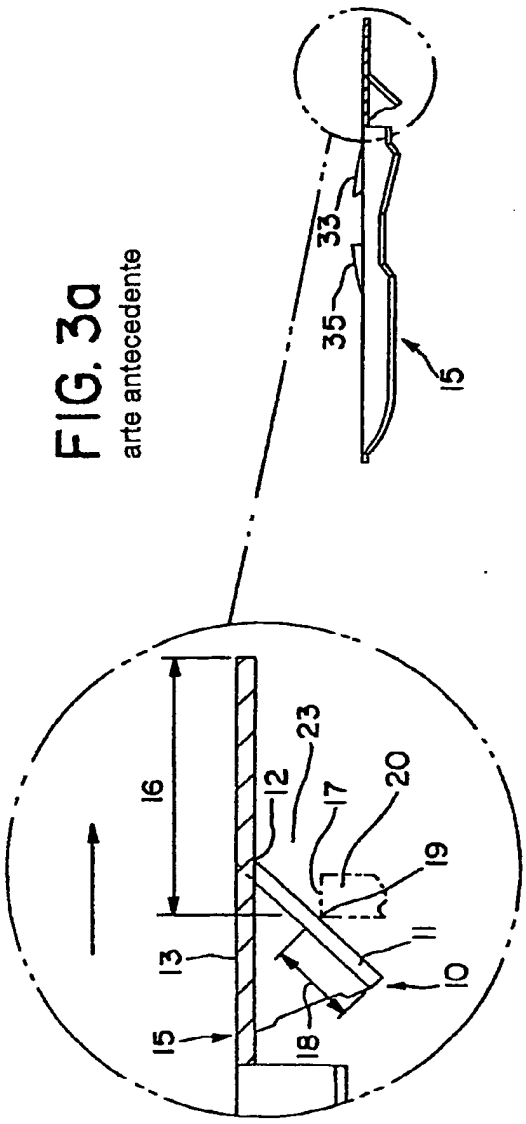

FIG. 3a
arte antecedente

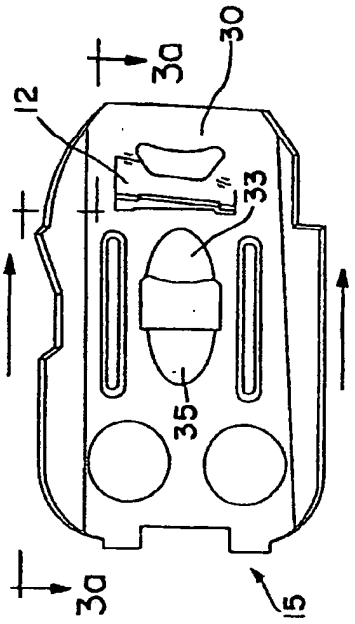

FIG. 3
arte antecedente

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FIG. 4

FIG. 4a

ARTE ANTECEDENTE

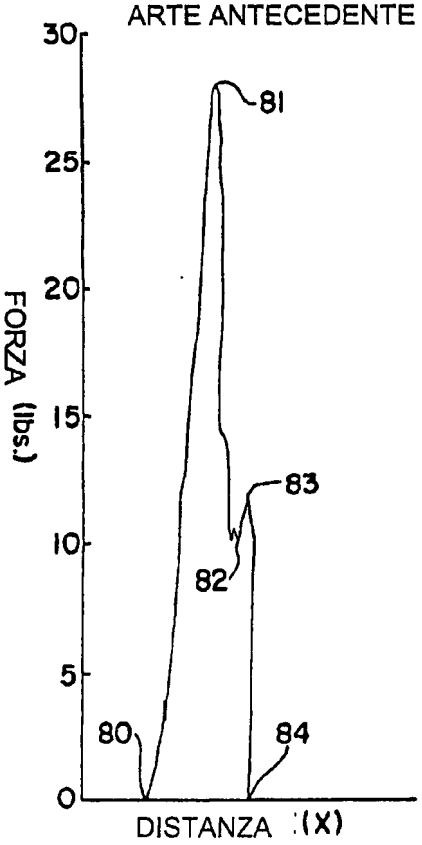


FIG. 4b

MIGLIORAMENTO

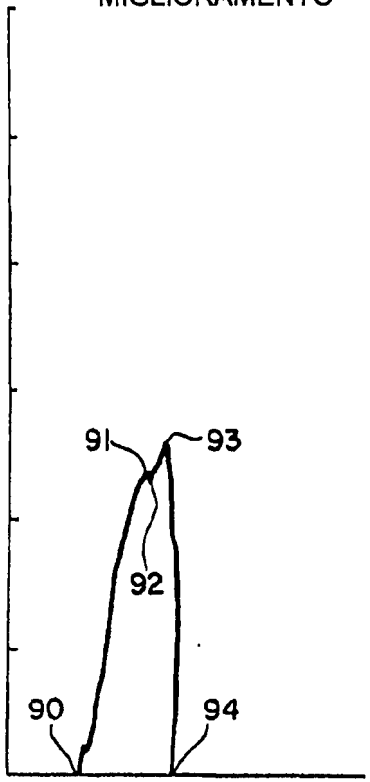
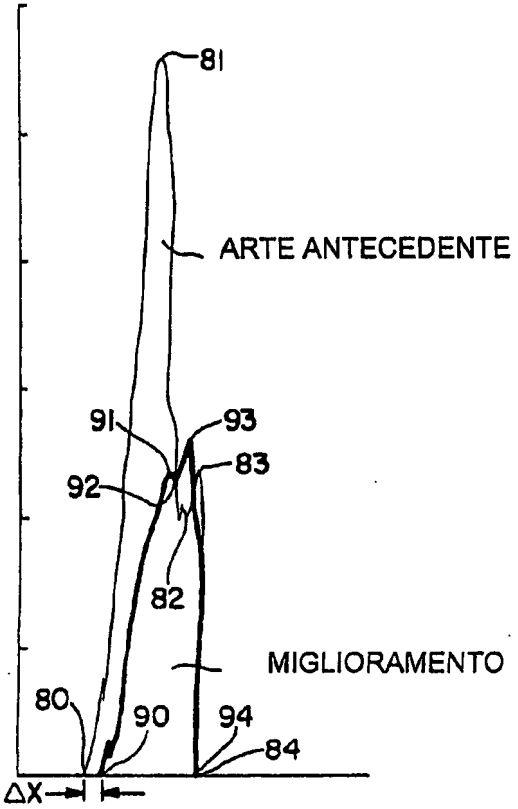


FIG. 4c



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(18)

Exhibit 1g

The Netherlands

OCTROOICENTRUM NEDERLAND

Ontvangstbevestiging

Ontvangstbevestiging van de volgende stukken betreffende een voor Nederland geldig Europees octrooi:

Behandelingsnummer	500015494	
EP octrooinummer	E1553239	
Datum ontvangst	18 november 2008	
Ontvangend bureau	Octrooicentrum Nederland, Rijswijk	
Uw referentie	NL907790EP-YR	
Octrooihouder	Worthington Armstrong Venture	
Aantal octrooihouders	1	
Land van herkomst	US	
Meegestuurde documenten	package-data.xml	EPNL-post.PDF (2 p.)
	nl-sfd-request.xml	ECONCL.pdf (1 p.)
Ingediend door	CN=H. Cooke 10293,O=Octrooibureau Los en Stigter B.V.,C=NL	
Methode van indiening	Online	
Datum en tijd aanmaak ontvangstbevestiging	18 november 2008, 09:29:27 (CET)	
Unieke reeks tekens	99:90:B5:61:1E:EE:8B:91:B1:25:01:99:F3:BD:8F:C8:B5:B5:C1:20	

/Cluster Octrooi Register tel. 0703986476 Octrooicentrum Nederland/

CONCLUSIES

1. Vergrendelende connector (21, 22) voor een rooster van een hangend plafond, omvattend een hoofdbalk (20) en dwarsbalken (26, 27),

- waarbij de vergrendelende connector (21) is ontworpen om te worden gestoken door een spleet (23) in de hoofdbalk (20) om te vergrendelen met een daar tegenoverliggende identieke vergrendelende connector (22) die zich reeds in de spleet (23) bevindt en is voorzien van een vrijhangende vergrendelingslip (40) die één geheel vormt met en scharniert van een basis (41) in de vergrendelende connector (21), en

- waarbij, wanneer de vergrendelende connector (21, 22) wordt gestoken door de spleet (23) in de hoofdbalk (20), de vergrendelende lip (40) door een zijde van de spleet (23) kan worden gedwongen om naar de basis (41) te buigen, zodat de vergrendelende lip (40) kan gaan door de spleet (23), en wanneer de vergrendelende connector (21, 22) door de spleet (23) is gestoken, de vergrendelende lip (21) terug kan buigen naar zijn ontspannen positie, waarin hij weg is gescharnierd van de basis (41), **met het kenmerk**, dat de vergrendelende lip (40) is gevormd met een gekromd deel voordat het zich uitstrekt als een rechte hefboom.

2. Vergrendelende connector volgens conclusie 1, **met het kenmerk**, dat het gekromde deel een radius vormt van ongeveer 0,1 cm (0,04 inch).

3. Vergrendelende connector volgens conclusie 1, **met het kenmerk**, dat de vergrendelende lip (40) een recht deel (43) heeft dat een hoek van ongeveer 42° vormt met de basis (41).

4. Vergrendelende connector volgens conclusie 1, **met het kenmerk**, dat een vertraging in contact tussen de zijde van de spleet (23) en de vergrendelende lip (40) is verschaft wanneer de vergrendelende connector (21, 22) door de spleet (23) wordt gestoken.

Exhibit 1h

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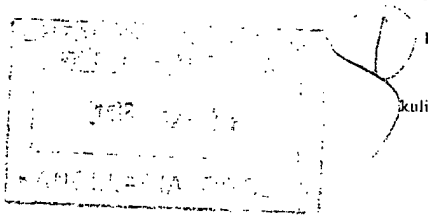

Urząd Patentowy RP
Departament Zgłoszeń
00-950 WARSZAWA
Al. Niepodległości 188/192

Nasz znak: 18654/PE/08
EP 1 553 239 B1

Warszawa, dnia 16 grudnia 2008r.

Dot.: Patentu Europejskiego nr EP 1 553 239 B1
pt.: „Łącznik blokujący"
na rzecz WORTHINGTON ARMSTRONG VENTURE,
Suite 200, 9 Old Lincoln Highway, Malvern, PA19355, Stany Zjednoczone Ameryki.

W związku z publikacją w dniu 17 września 2008 r. informacji o udzieleniu patentu europejskiego nr EP 1 553 239 B1, na podstawie art. 6 ust. 2 ustawy o dokonywaniu europejskich zgłoszeń patentowych oraz skutkach patentu europejskiego w Rzeczypospolitej Polskiej z dnia 14 marca 2003 r. (Dz. U. nr 65, poz. 598) składamy tłumaczenie na język polski opisu i zastrzeżeń patentowych oraz cytowanych odnośników i rysunków.

Jednocześnie wnosimy opłatę w wysokości 200,00 zł za publikację tłumaczenia patentu europejskiego zawierającego 11 dodatkowych stron.

. Alicja Piotrowicz
Rzecznik Patentowy

Załączniki:

1. tłumaczenie pierwszej strony publikacji patentu europejskiego,
2. kopia pierwszej strony publikacji patentu europejskiego,
3. dokument pełnomocnictwa,
4. dokument substytucji,
5. kopia potwierdzenia wniesienia opłaty skarbowej od pełnomocnictwa i substytucji,
6. 2 egz. opisu wynalazku (14 stron),
7. 2 egz. zastrzeżeń patentowych (2 strony),
8. 2 egz. rysunku (4 strony),
9. 2 egz. cytowanych odnośników (1 strona),
10. kopia tłumaczenia pierwszej strony publikacji patentu europejskiego, opisu wynalazku, zastrzeżeń, cytowanych odnośników i rysunku na dysku CD.

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est

(19) Europäisches Patentamt
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E04B 9/12 *(2006.01)*

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(22) Date of filing: **11.11.2004**

(54) **Locking connector**

Arretierverbindungsstück

Connecteur de verrouillage

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LU MC NL PL PT RO SE SI SK TR

(30) Priority: **09.01.2004 US 754323**

(43) Date of publication of application:
13.07.2005 Bulletin 2005/28

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(56) References cited:
US-A- 4 108 563
US-A- 4 317 641
US-A- 4 621 474
US-A- 5 839 246

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(19) Europejski Urząd Patentowy

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(84) Kraje wyznaczone:
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(56) Cytowane odnośniki:
US-A- 4 108 563
US-A- 4 317 641
US-A- 4 621 474
US-A- 5 839 246

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[0001] Sufity podwieszane są szeroko stosowane w budynkach komercyjnych i przemysłowych. W sufitach tego rodzaju, metalowa kratownica wzajemnie połączonych głównych belek i poprzecznych belek podwieszana jest ze stropu konstrukcyjnego za pośrednictwem drutów. Kratownica ta podtrzymuje panele akustyczne w prostokątnych otworach uformowanych w kratownicy.

[0002] Wynalazek dotyczy łączników blokujących stosowanych w kratownicy do łączenia pary przeciwległych poprzecznych belek i głównej belki na przecięciach kratownicy.

[0003] Podwieszane sufity posiadające metalowe belki połączone wzajemnie w kratownicę, która podtrzymuje panele są dobrze znane (na przykład z patentów USA 5,839,246 lub 6,178,712).

[0004] Kratownica w takich sufitach posiada na każdym przecięciu kratownicy parę przeciwległych poprzecznych belek oraz główną belkę, które tworzą połączenie.

[0005] Każda poprzeczna belka w takim połączeniu posiada łącznik na swoim końcu, który jest wciskany lub wbijany, z przeciwnych stron głównej belki, poprzez szczelinę w głównej belce. Wszystkie łączniki są identyczne.

[0006] Łącznik, który wkładany jest do szczeliny jako pierwszy, chroniony jest przed wypadnięciem ze szczeliny przez wspornikowy zatrzask tego łącznika, o postaci obrotowej giętkiej sprężyny płytkowej. Tego rodzaju zatrzask, który jest zintegrowany z podstawą łącznika i uformowany z niej

poprzez wykrawanie, odchylony jest w kierunku położenia otwartego. Zatrzask, który jest odchylony pod kątem od podstawy łącznika, odgina się w kierunku położenia zamkniętego pod wpływem ograniczenia boku szczeliny, gdy łącznik jest wbijany poprzez szczelinę w celu utworzenia połączenia, ale który odchyla się następnie z powrotem do swojego odchylonego położenia spoczynkowego dla zapobieżenia wyciągnięcia łącznika z powrotem ze szczeliny.

[0007] Następnie, przez szczelinę w zmniejszonej przestrzeni tej szczeliny wbijany jest inny łącznik na przeciwległej poprzecznej belce, identyczny z pierwszym łącznikiem. Zatrzask na tym łączniku styka się z bokiem szczeliny w pobliżu osi zatrzasku i jest odchylany w kierunku położenia zamkniętego.

[0008] Szczególnie przy wkładaniu drugiego łącznika do szczeliny, z liniowym ruchem wbijania, do wykonania połączenia niezbędne jest wykonanie dużej pracy i użycie sporej siły.

[0009] Opór powstaje niemal natychmiast, gdy drugi łącznik w szczelinie wchodzi do szczeliny i kontynuuje ruch, aż do osadzenia go w położeniu zablokowanym, jak opisano poniżej, przy obecności pierwszego łącznika w szczelinie.

[0010] Obydwa łączniki łączą się wzajemnie, gdy drugi łącznik jest całkowicie umieszczony w szczelinie. Zaczepy uformowane z podstawy łącznika, mające postać zgrubień, które posiadają stronę krzywkową oraz stronę blokującą, a także końce łączników, zginają się i odginają w celu połączenia w formę nazywaną czasami połączeniem łącznik-do-łącznika lub łącznikiem typu „uścisk dłoni". Tego rodzaju połączenie typu „uścisk dłoni" pomiędzy łącznikami chroni przed liniowym

wyciągnięciem łączników ze szczeliny. Łączniki utrzymywane są poprzecznie i pionowo razem przez szczelinę w głównej belce.

[0011] W osadzonym zablokowanym położeniu drugi łącznik jest poziomo wyrównany z pierwszym łącznikiem wewnątrz szczeliny, tak że zaczepy blokujące na łącznikach są połączone i utrzymywane na tym samym poziomie w celu utworzenia połączenia typu łącznik-do-łącznika. Ogólnie drugi łącznik musi być albo podniesiony albo wciśnięty, gdy wchodzi do szczeliny w celu uzyskania takiego poziomego wyrównania. Dlatego profil krawędzi natarcia łącznika zwęża się w celu prowadzenia łącznika w trakcie jego ruchu poprzez szczelinę głównej belki.

[0012] Tego rodzaju łączniki rodzajowego typu ujawnione są na przykład w dokumentach US 5 839 246 lub US 4 317 641. Ten stan techniki dotyczy łącznika blokującego dla kratownicy sufitu podwieszanego, opisanego we wstępie do zastrzeżenia 1.

[0013] Celem wynalazku jest opracowanie łącznika blokującego, który do wykonania połączenia wymaga znacznie mniejszej siły i mniejszego nakładu pracy.

[0014] Wymagany jest mniejszy nakład pracy i mniejsza siła, gdyż przy wkładaniu drugiego łącznika do zmniejszonego obszaru szczeliny głównej belki (1) występuje opóźnienie w styczności pomiędzy zatrzaskiem blokującym a bokiem szczeliny, tak że w trakcie opóźnienia (2) łączone elementy są pozycjonowane przy najmniejszym oporze wynikającym z sił tarcia, a także (3) gdy występuje styczność pomiędzy elementami, elementy te są pozycjonowane oferując najmniejszy opór do wykonania połączenia.

[0015] W celu uzyskania powyższego efektu, formuje się zatrzask blokujący, który w swoim nieodgiętym położeniu musi

rozciągać się poprzecznie wystarczająco daleko od podstawy łącznika w celu zabezpieczenia przed wyciągnięciem pierwszego łącznika poprzez szczelinę zanim włożony zostanie drugi łącznik, posiadający zakrzywioną część przed częścią rozciągającą się w postaci prostej dźwigni.

[0016] To, jak przedstawiono w punkcie (1) powyżej opóźnia styczność pomiędzy zatrzaskiem a bokiem szczeliny, gdy drugi łącznik jest wkładany w szczelinę, i jak przedstawiono w punkcie (2) powyżej taka styczność następuje dale wzdłuż zatrzasku od punktu obrotu, bliżej końca zatrzasku tworząc dłuższe ramie dźwigni, tak że mniejsza siła potrzebna jest do zamknięcia zatrzasku.

[0017] Zewnętrzny koniec zatrzasku blokującego w położeniu nieodgiętym rozciąga się do tego samego położenia, co prosty zatrzask ze stanu techniki obracany pod kątem ostrym. Położenie to jest niezbędne, aby łącznik nie mógł zostać wyciągnięty po przejściu zatrzasku przez szczelinę.

[0018] Także w trakcie opóźnienia wymienionego w punkcie (1) powyżej, drugi łącznik umieszczany jest poprzez zwężenie na jego wiodącym końcu, który zajmuje albo górę albo dół szczeliny, do takiego samego horyzontalnego poziomu co pierwszy łącznik, bez oporu tarcia stwarzanego w połączeniu według stanu techniki, gdzie zatrzask blokujący praktycznie natychmiast zbliża pierwszy łącznik i drugi łącznik poprzecznie do siebie.

[0019] Poprzez szybsze dopasowanie drugiego łącznika pionowo, gdy przechodzi on przez szczelinę, zaczepy blokujące oraz końce łącznika, które łączą się ze sobą poprzez odgięcie, znajdują się w położeniu, jak przedstawiono to w

punkcie (3), w celu uzyskania najmniejszego oporu takiego połączenia.

[0020] Na Fig. 1 przedstawiono widok z prawej strony połączenia dwóch poprzecznych belek poprzez szczelinę w głównej belce, ukazując łączniki według wynalazku w połączeniu typu łącznik-do-łącznika.

Na Fig. 2 przedstawiono widok z prawej strony łącznika według wynalazku, przedstawiony w połączeniu z Fig. 1.

Na Fig. 2a przedstawiono przekrojowy widok z góry łącznika według niniejszego wynalazku wzdłuż linii A-A z Fig. 2, z powiększoną zaznaczoną częścią, ukazującą zatrzask według wynalazku.

Na Fig. 3 i 3a przedstawiono widoki ukazujące stan techniki odpowiadający widokom z Fig. 2 i 2a.

Na Fig. 3 przedstawiono widok z boku łącznika ze stanu techniki.

Na Fig. 3a przedstawiono przekrojowy widok z góry łącznika ze stanu techniki wzdłuż linii A-A z Fig. 3, z powiększoną zaznaczoną częścią, ukazującą zatrzask według wynalazku.

Na Fig. 4 przedstawiono grupę wykresów, 4a, 4b i 4c, na których przedstawiono siły stosowane przy wykonywaniu połączenia.

Na Fig. 4a przedstawiono wykres siły niezbędnej do przezwyciężenia oporu wykonania połączenia ze stanu techniki.

Na Fig. 4b przedstawiono wykres siły niezbędnej do przezwyciężenia oporu przy wykonaniu połączenia według wynalazku.

Na Fig. 4c przedstawiono wykres nałożonych sił z Fig. 4a i 4b.

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[0021] Na przedstawionych rysunkach połączenie według wynalazku przedstawiono na Fig. 1, 1a, zaś wynalazek pokazano wyraźniej na Fig. 2 i 2a. W niniejszym połączeniu główna belka 20, pokazana w przekroju poprzecznym, rozciąga się wzdłuż kratownicy sufitu. Identyczne łączniki 21 i 22 zostały wbite w szczelinę 23 w środniku 25 głównej belki 20 i połączone. Łączniki 21 i 22 są połączone odpowiednio z poprzecznymi belkami 26 i 27 za pośrednictwem nitów 28. Połączenie to odznacza się następującymi cechami:

(1) Koniec 30 łącznika 21 łączy się z zaczepem 31 tworząc połączenie typu łącznik-do-łącznika, jak również koniec 32 łącznika 22 łączy się z zaczepem 33;

(2) Zatrzaski blokujące 40 na łączniku 21 i łączniku 22 znajdują się w położeniu niewygiętym;

(3) Tylne ograniczniki 35 i 36 na łącznikach 21 i 22 mocują końce 30 i 32 w połączeniu typu łącznik-do-łącznika, a także

(4) Łączniki 21 i 22 utrzymywane są poprzecznie i pionowo wewnątrz szczeliny 23 przez przekrojową konfigurację łączników, co jest dobrze znane ze stanu techniki.

[0022] Dotychczas opisana ogólna konfiguracja jest zgodna ze stanem techniki.

[0023] Przy wykonywaniu połączenia przedstawionego na Fig. 1 i 1a oraz w cytowanych patentach, pierwszy łącznik, albo łącznik 21 albo 22, które obydwa są identyczne, wkładany jest lub wbijany poprzez szczelinę 23 w sposób znany ze stanu techniki. W niniejszym opisie przyjmujemy, że łącznik 21 wkładany jest poprzez szczelinę jako pierwszy.

[0024] Zatrzask blokujący 40 styka się z bokiem szczeliny 23 i jest odginany wystarczająco do umożliwienia przejścia zatrzasku 40 przez szczelinę 23 i odgina się z powrotem do

położenia spoczynkowego w ruchu jednokierunkowym. W tym położeniu pierwszy łącznik 21 utrzymywany jest wewnątrz szczeliny 23.

[0025] Następnie przez szczelinę przepychany jest drugi łącznik 22 wzdłuż pierwszego łącznika 21. Ponownie zatrzask blokujący 40 styka się z bokiem szczeliny 23, ale teraz jest już mniej miejsca w szczelinie, gdyż włożony już został poprzedni łącznik. Drugi łącznik 22, podczas przepychania go przez szczelinę 23, odgina zatrzask 40 w kierunku położenia zamkniętego, aż zatrzask ten przejdzie przez szczelinę, po czym odgina się on otwierając do położenia spoczynkowego. Łączniki 21 i 22 tworzą także połączenie typu łącznik-do-łącznika, jak przedstawiono to na Fig. 1, przy czym zaczepy 31 i 33 oraz końce belek 30 i 32 wygięły się i ponownie się odgięły do spoczynkowego położenia początkowego.

[0026] W tych wbijanych połączeniach, gdy drugi łącznik, na przykład łącznik 22, przechodzi poprzez szczelinę 23 do położenia osadzonego, po umieszczeniu w szczelinie pierwszego łącznika 21, zachodzi co następuje:

(1) Drugi łącznik 22 jest dopasowany pionowo wewnątrz szczeliny 23.

(2) Drugi łącznik 22 jest dopychany poprzecznie przez bok szczeliny 23 od pierwszego łącznika 21.

(3) Zatrzask blokujący 40 na drugim łączniku 22 jest odginany w kierunku położenia zamkniętego przez bok szczeliny 23 aż do przejścia zatrzasku 40 przez szczelinę 23, po czym rozpręża się on otwierając się do położenia spoczynkowego, jak widać to na przykład na Fig. 1.

(4) Zatrzaski blokujące 31 i 33 oraz końce 30 i 32 na pierwszym łączniku i drugim łączniku 21 i 22, są rozginane,

gdy stykają się one ze sobą, a następnie odginane z powrotem do położenia zablokowanego.

[0027] W stanie techniki wymienione wyżej etapy od (1) do (4) nakładały się lub następowały faktycznie jednocześnie, tak iż siła i praca wymagane do wykonania połączenia 10 były nie tylko sumą sił niezbędnych do przezwyciężenia sumy poszczególnych oporów stwarzanych przez etapy (1), (2), (3) i (4), określonych bezpośrednio powyżej, ale także siłą i pracą wymaganą do przezwyciężenia tarcia wytwarzanego, gdy siły (1), (2), (3) i (4) nakładały się lub występowały jednocześnie. Do tych oporów tarcia należały:

a. Tarcie pomiędzy zatrzaskiem 40 na drugim łączniku 22 a bokiem szczeliny 23, gdy drugi łącznik 22 wkładany był pionowo w szczelinę 23.

b. Tarcie poprzecznie pomiędzy podstawą łączników 21 i 22.

c. Tarcie pomiędzy górą lub dołem drugiego łącznika 22 a górą lub spodem szczeliny 23, gdy drugi łącznik 22 umieszczany był pionowo w szczelinie 23.

d. Tarcie pomiędzy zaczepami 31 i 33, a końcami 30 i 32 na pierwszym łączniku 21 i drugim łączniku 22 w szczelinie 23, gdy drugi łącznik 22 był umieszczany pionowo w szczelinie 23.

[0028] W stanie techniki przy zamiarze zmniejszenia całkowitego wymaganego nakładu pracy i siły, wykonano zwężenie 37 lub pochylenie na wiodącej krawędzi znanego łącznika 15, zgodnie z tym, co pokazano na Fig. 3, ze stopniowym pochyleniem, dzięki czemu, gdy drugi łącznik był pionowo umieszczany w szczelinie 23, siły tarcia mogły być rozłożone na długości ruchu wkładania.

[0029] Rozwiązanie według wynalazku zasadniczo redukuje siłę niezbędną do pokonania oporu pochodzącego z powyższych

tarć a), b), c) i d) oraz sił niezbędnych w etapie (3) do wygięcia zatrzasku blokującego 40 według wynalazku w kierunku położenia zamkniętego oraz w etapie (4) do wygięcia zaczepów 31 i 33 oraz końców 30 i 32 wzajemnie względem siebie w celu utworzenia połączenia typu łącznik-do-łącznika.

[0030] Podobnie jak w stanie techniki, tak według wynalazku formowany jest zatrzask 40 o postaci wspornikowej sprężyny płytkowej, poprzez przebicie, od podstawy 39 łącznika, jak widać to na przykład na Fig. 2 i 2a. Zatrzask według stanu techniki, oznaczony numerem 10 na Fig. 3 i 3a, ma postać prostej dźwigni 11, obrotowej w punkcie 12. Tworzy on kąt ostry z podstawą 13 znanego łącznika 15.

[0031] Według wynalazku zatrzask 40, jak widać to na Fig. 2 i 2a, uformowany jest z podstawy 41 z promieniem 42, wynoszącym na przykład 0,1 cm (0,04 cala), zanim rozciągać się będzie w postaci prostej dźwigni. Prosta część 43 zatrzasku 40 według wynalazku tworzy kąt około 42° z podstawą 41. Tego rodzaju krzywa w zatrzasku blokującym 40 zwiększa odległość 46 drugiego łącznika 21 lub 22, wchodzi do szczeliny 23 zanim zetknie się z bokiem szczeliny 23 w punkcie 47 do wytwarzania oporu pochodzącego od zatrzasku 40 według wynalazku o bok szczeliny 23. Tego rodzaju zakrzywiony zatrzask blokujący 40 według wynalazku redukuje także odległość 48 na jakiej zatrzask 40 według wynalazku styka się z bokiem szczeliny 23, gdy jest on odginany w kierunku położenia zamkniętego, gdy przechodzi przez szczelinę 23, gdyż styka się ona z zatrzaskiem 40 bliżej końca zatrzasku w odróżnieniu od znanego prostego zatrzasku 10.

[0032] Przykładowe wymiary zatrzasku blokującego 40 według wynalazku przedstawiono na Fig. 2a.

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[0033] Ponadto pierwszy kontakt zatrzasku 40 według wynalazku z bokiem szczeliny 23 następuje za punktem 51 zatrzasku 40 według wynalazku, gdzie łączy się on z podstawą 41, gdyż fragment zakrzywionej części zatrzasku 40 według wynalazku rozciąga się w płaszczyźnie podstawy 41 i nie jest wystawiony na styczność z bokiem szczeliny 23. Punkt 51 stanowi początek ścięcia oraz początek wygięcia zatrzasku 40 według wynalazku, jak widać to na Fig. 2a.

[0034] Zatem, siła wywierana przez bok szczeliny 23, gdy zatrzask 40 według wynalazku przechodzi przez tę szczelinę, działa dalej od punktu 51 obrotu niż ma to miejsce w stanie techniki, wymagając dzięki temu mniejszej siły do obrócenia zatrzasku 40 według wynalazku niż znanego zatrzasku o postaci prostej dźwigni, gdyż siła ta ma większe ramię dźwigni w zatrzasku 40 według wynalazku, gdy styka się on z bokiem szczeliny 23 gdy wpychany jest on do połączenia.

[0035] Tak więc, do wsuwania zatrzasku 40 według wynalazku wymagana jest mniejsza siła na krótszym dystansie, niż było to wymagane dla zatrzasku 10 ze stanu techniki. Skutkuje to zasadniczo mniejszą pracą, jaka musi być wykonana do utworzenia połączenia. Ten korzystny efekt w jednym połączeniu jest zwielokrotniony przez wiele połączeń, jakie muszą zostać wykonane w kratownicy sufitu podwieszanego.

[0036] W połączeniu udoskonalonym przez wynalazek, w trakcie wkładania łącznika, konieczne jest dostosowanie łącznika pionowo, tak że, gdy będzie całkowicie włożony, łącznik ten będzie pasował pionowo do szczeliny 23.

[0037] Ze względu na to, że siła konieczna do wkładania znanego zatrzasku 10 była dość duża i narastała w pobliżu głównej krawędzi łącznika, zwężenie, które prowadziło łącznik

pionowo do jego całkowicie osadzonego położenia, tak aby łącznik znajdował się na swoim miejscu pionowo po całkowitym włożeniu, było stopniowe dla ograniczenia dodatkowego oporu w każdym punkcie przy wkładaniu.

[0038] Nawet więc wówczas, gdy tworzone było połączenie typu łącznik-do-łącznika, w którym odginane były zaczepy, łącznik był wciąż dopasowywany pionowo, w związku z koniecznością wykonania zwężenia stopniowego a nie skokowego, w rezultacie wytwarzając jeszcze większy opór.

[0039] Według wynalazku zwężenie 38 wiodącej krawędzi łącznika 21, 22 jest stosunkowo ostre, pod ostrzejszym kątem, tak że względne natychmiastowe dopasowanie wykonuje się pionowo względem łącznika, gdy jest on wkładany do szczeliny 23. Nawet mimo tego, że bardziej strome, bezpośrednie dopasowanie wymagałoby normalnie większej siły przy wkładaniu niż w przypadku zwężenia stopniowego, to wymagana jest mniejsza a nie większa siła. To zredukowanie wymaganej siły uzyskiwane jest dzięki opóźnionej styczności zatrzasku blokującego 40 według wynalazku z bokiem szczeliny 23, gdyż praktycznie nie występuje przeszkoda czy też opór z zatrzasku blokującego 40 według wynalazku.

[0040] Istnieje dodatkowa korzyść, która uzyskiwana jest dzięki wczesnemu pionowemu ułożeniu łącznika wewnątrz szczeliny 23 w trakcie wkładania. Gdy zaczepy 31 i 33 na końcach 30 i 32 pierwszego łącznika i drugiego łącznika 20 i 21 według wynalazku wchodzą w kontakt, zaczepy i końce znajdują się w położeniu pionowym względem siebie, gdzie jest najmniejszy opór wyginania tych elementów poprzecznie do położenia blokującego. Natomiast, w stanie techniki kontakt tworzony był pomiędzy zaczepami a końcami i pomiędzy tymi

elementami wywierana była siła poza ich najbardziej wygiętym położeniem, a siła wymagana do wygięcia zaczepów i końców była ponownie dość duża.

[0041] Na Fig. 3 i 3a przedstawiono łącznik ze stanu techniki, zaś na Fig. 2 i 2a przedstawiono łącznik blokujący według wynalazku.

[0042] Zgodnie z tym, co pokazano na Fig. 3 i 3a znany zatrzask 10 o postaci prostej dźwigni 11 obraca się pod kątem ostrym względem podstawy 13 łącznika 15 ze stanu techniki. Linia punktowa 17, na powiększonym fragmencie, oznacza bok szczeliny 23 gdy łącznik 15 ze stanu techniki jest wkładany do szczeliny 23. Znany łącznik 15 pokonuje odległość 16 zanim napotyka bok szczeliny w punkcie 19, co następuje w odległości 18 od końca zatrzasku 10 ze stanu techniki.

[0043] Na Fig. 2 i 2a przedstawiono według wynalazku łącznik 22, który jest identyczny z łącznikiem 21, posiadający zatrzask 40. Podobnie jak na Fig. 3a linia punktowa 17 na powiększonym fragmencie oznacza bok szczeliny 23, gdy łącznik 22 jest do niej wkładany. Łącznik 22 pokonuje odległość 46 zanim napotyka bok szczeliny 23 w punkcie 47. Jest to odległość 48 od końca zatrzasku 40 według niniejszego wynalazku.

[0044] Korzyści z wynalazku w stosunku do rozwiązania ze stanu techniki przedstawiono graficznie na Fig. 4a, 4b i 4c.

[0045] Na Fig. 4, wliczając w to figury 4a, 4b i 4c, przedstawiono opory napotykane w połączeniu ze stanu techniki w porównaniu do sił napotykanych w połączeniu z ulepszonym łącznikiem według wynalazku.

[0046] W stanie techniki linia od 80 do 81 oznacza opór napotykany w trakcie początkowej fazy wkładania drugiego

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łącznika do szczeliny, gdy zatrzask 10 jest odginany od swego początkowego kontaktu z bokiem szczeliny 23, aż opór osiągnie maksymalną wartość wynoszącą około 12,25 kg (27 funtów) w punkcie 81.

[0047] Styczność prostej dźwigni 11 znanego zatrzasku 10 zachodzi stosunkowo blisko czopu 12. W punkcie 81 następuje spadek oporu w trakcie przechodzenia do punktu 82, do około 10 funtów. Zatrzask 10 prostej dźwigni według stanu techniki w trakcie tego spadku styka się z bokiem szczeliny 23 dalej wzdłuż prostej dźwigni 11, gdy przechodzi on przez szczelinę 23, tak że wymagana jest mniejsza siła, gdyż ramię dźwigni jest dłuższe niż przy początkowej styczności.

[0048] W punkcie 82 ponownie następuje wzrost oporu ze względu na wygięcie zaczepów 31 i 33 oraz końców łącznika 30 i 32, gdy tworzą one połączenie typu łącznik-do-łącznika. Opór narasta do punktu 83, w którym tworzenie połączenia typu łącznik-do-łącznika jest ukończone, zaś wszystkie elementy uległy wygięciu na powrót do położenia spoczynkowego bez występowania dalszego oporu i ruchu.

[0049] Siły wymagane do pokonania oporu napotykanego przy tworzeniu połączenia z ulepszeniem według wynalazku przedstawione zostały graficznie na Fig. 4a. Pokazano na Fig. 4a ten sam ruch drugiego łącznika 22 do wnętrza szczeliny 23, posiadającego zatrzask 40 według wynalazku, jaki przedstawiono w przypadku łącznika ze stanu techniki. Początkowy kontakt z bokiem szczeliny 23 następuje w punkcie 90 i trwa do punktu 91, w którym występuje opór o wartości około 14 funtów, następuje bardzo łagodny spadek oporu, zatrzask 40 według niniejszego wynalazku przechodzi poprzez szczelinę. Następnie opór wzrasta do punktu 93 przy wartości

około 16 funtów, gdy tworzone jest połączenie typu łącznik-do-łącznika, gdy odginane są zaczepy 31 i 33 oraz końce łącznika 30 i 32, po czym następuje spadek oporu w punkcie 94, gdzie ustaje wszelki opór po utworzeniu połączenia typu łącznik-do-łącznika.

[0050] Wymagana siła, a także odległość, na której siła ta musi być przykładana, są oczywiście znacznie mniejsze przy tworzeniu połączenia z wykorzystaniem łącznika blokującego według wynalazku.

[0051] Na Fig. 4c przedstawiono nałożenie wykresów z Fig. 4a i 4b z zablokowanym położeniem połączenia ze stanu techniki i połączeniem według wynalazku w postaci nałożonego wspólnego punktu na osi poziomej w punkcie 96. ΔX na wykresie oznacza odległość opóźnienia kontaktu pomiędzy zatrzaskiem 15 ze stanu techniki a zatrzaskiem 40 według niniejszego wynalazku, z bokiem 17 szczeliny 23 przy wkładaniu drugiego łącznika do wnętrza szczeliny. Ponownie, Fig. 4c o postaci wykresu pokazuje znaczne zmniejszenie siły i pracy wymaganych do utworzenia połączenia według wynalazku w stosunku do wykonania połączenia znanego ze stanu techniki.

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Zastrzeżenia patentowe

1. Łącznik blokujący (21, 22) przeznaczony do kratownicy podwieszanego sufitu zawierającej główną belkę (20) i poprzeczne belki (26, 27),

- przy czym łącznik blokujący (21) zaprojektowany jest do wbicia poprzez szczelinę (23) w głównej belce (20) w celu zablokowania z przeciwległym identycznym łącznikiem blokującym (22) zainstalowanym w szczelinie (23), a także posiada wspornikowy zatrzask blokujący (40) zintegrowany z i podparty obrotowo na podstawie (41) w łączniku blokującym (21), a także
- gdy łącznik blokujący (21, 22) jest wbijany przez szczelinę (23) w głównej belce (20), zatrzask blokujący (40) może być zmuszony przez bok szczeliny (23) do wygięcia się w kierunku podstawy (41) w celu umożliwienia przejścia zatrzasku blokującego (40) przez szczelinę (23), zaś po przepchnięciu łącznika blokującego (21, 22) przez szczelinę (23), zatrzask blokujący (40) może odgiąć się do swojego położenia spoczynkowego, w którym obraca się w kierunku od podstawy (41), **znamienny tym, że** zatrzask blokujący (40) ma zakrzywioną część przed częścią rozciągającą się do prostej dźwigni.

2. Łącznik według zastrz. 1, **znamienny tym, że** zakrzywiona część ma promień około 0,1 cm (0,04 cala).

3. Łącznik według zastrz. 1, **znamienny tym, że** zatrzask blokujący (40) posiada prostą część (43), która tworzy z podstawą (41) kąt około 42°.

4. Łącznik według zastrz. 1, **znamienny tym, że** gdy łącznik blokujący (21, 22) wbijany jest poprzez szczelinę (23) następuje opóźnienie w styczności pomiędzy bokiem szczeliny (23) a zatrzaskiem blokującym (40).

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DOKUMENTY PRZYTOCZONE W OPISIE

Lista przytoczonych przez Zgłaszającego dokumentów została zamieszczona wyłącznie do informacji czytelnika i nie stanowi części składowej europejskiego dokumentu patentowego. Została ona zestawiona z największą starannością; EUP nie ponosi jednakże żadnej odpowiedzialności za ewentualne błędy lub braki.

Dokumenty patentowe cytowane w opisie

- US 5839246 A **[0003] [0012]**
- US 6178712 B **[0003]**
- US 4317641 A **[0012]**

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FIG. 1

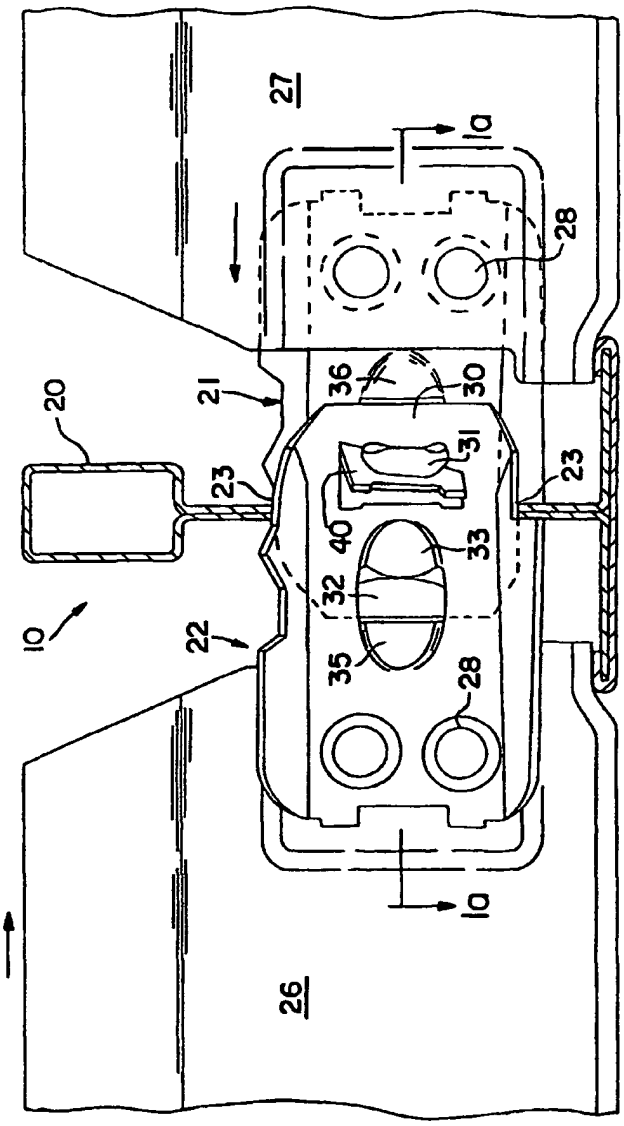
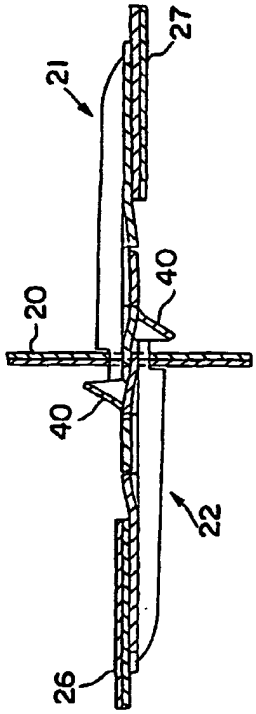


FIG. Ia



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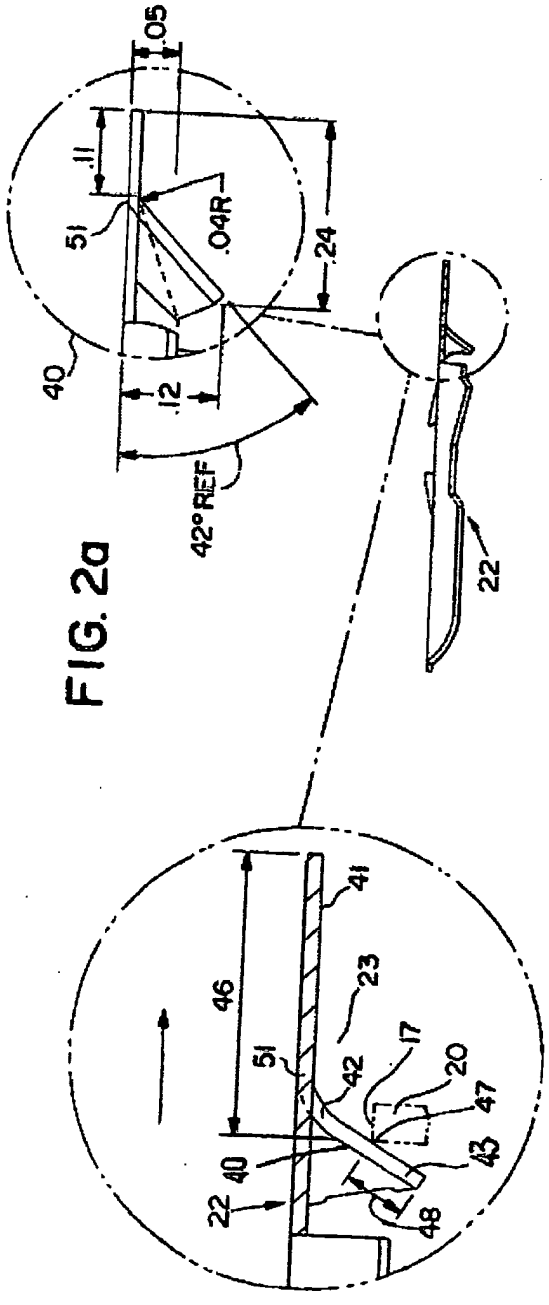

FIG. 2a

WBIJANIE

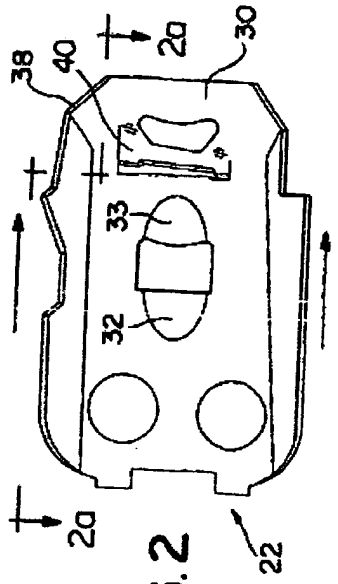

FIG. 2

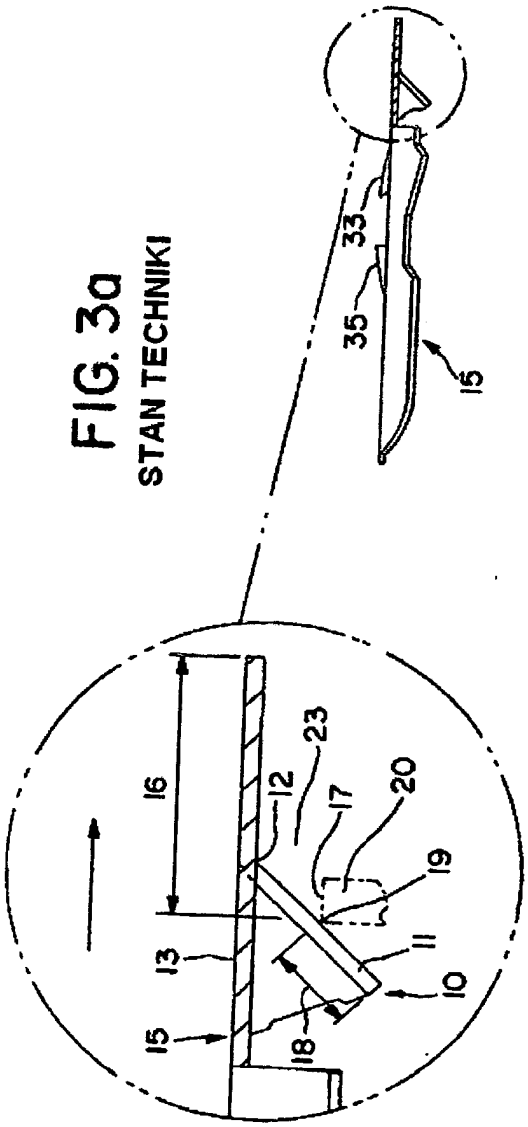

FIG. 3a
STAN TECHNIKI

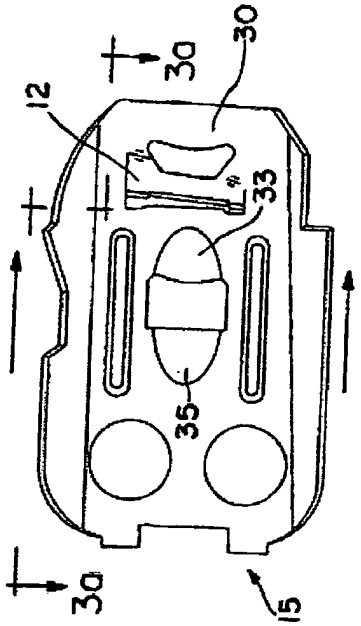

FIG. 3
STAN TECHNIKI

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FIG. 4

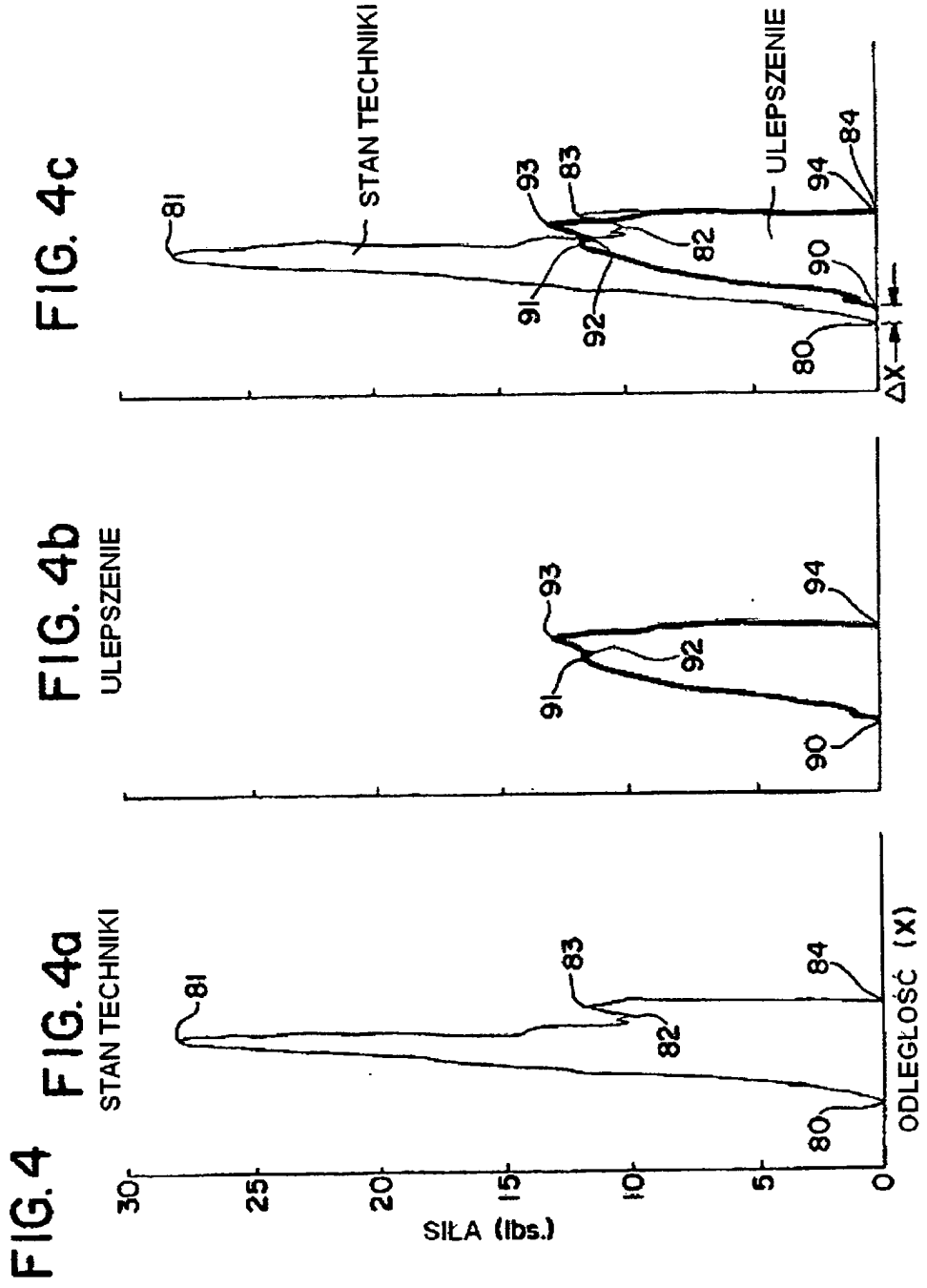
FIG. 4a
STAN TECHNIKI
81
82
83
84
80
30
25
20
15
10
5
0
SIŁA (lbs.)
ODLEGŁOŚĆ (X)
FIG. 4b
ULEPSZENIE
93
92
91
94
90
FIG. 4c
STAN TECHNIKI
81
93
83
82
91
92
ULEPSZENIE
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Urząd Patentowy RP
Departament Rejestrów
Al. Niepodległości 188/192
00-950 Warszawa

Warszawa, 20 stycznia 2009

Nasz znak: **DR-PL/EP- 1553239 -MS**
Wasz znak: 18654/PE/08

WEZWANIE

W związku ze złożeniem w dniu 16.12.2008 tłumaczenia patentu europejskiego **EP 1553239** (nr zgłoszenia 04026847.6)
tytuł: ***Łącznik blokujący***

kody wyznaczonych państw: AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LI, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR
pierwszeństwo: US20040754323 09.01.2004
uprawniony: Worthington Armstrong Venture, Malvern, US
twórca: Sareyka Brett W., West Chester, US
Lin Yu, Blue Bell, US
Platt William J., Aston, US
MKP: E04B9/12 (2006.01)

Urząd Patentowy RP wzywa do uiszczenia opłaty w wysokości **200 PLN** za publikację tłumaczenia, **w terminie trzech miesięcy od daty doręczenia wezwania.**

Dane bibliograficzne wskazane w wezwaniu wykorzystane będą dla celów publikacji nadesłanego tłumaczenia patentu europejskiego, a także zostaną wpisane do wyodrębnionej części rejestru patentowego prowadzonej dla dokonywania wpisów o stanie prawnym patentów europejskich.

Wzmianka o publikacji tłumaczenia ukaże się w Wiadomościach Urzędu Patentowego nr **03/2009**

Jednocześnie Urząd informuje, iż opłaty za okres ochrony rozpoczynający się po roku ochrony, w którym Europejski Urząd Patentowy opublikował informację o udzieleniu patentu europejskiego, należy wnieść zgodnie z ustawą Prawo własności przemysłowej, oraz art. 141 ust. 2 Konwencji o patencie europejskim, w kwocie wynikającej z załącznika nr 1 do rozporządzenia Rady Ministrów z dnia 29 sierpnia 2001r.

Przedmiotowy patent europejski zgłoszono do ochrony dnia **11.11.2004** (o czym ogłoszono w Europejskim Biuletynie Patentowym *2005/28* w dniu *13.07.2005*), natomiast informację o jego udzieleniu opublikowano w dniu *17.09.2008* (w Europejskim Biuletynie Patentowym *2008/38*), tj. w **4** roku od daty zgłoszenia.

Tym samym opłata za **5** rok ochrony powinna być uiszczona do dnia **17.11.2008** w kwocie **300 PLN**, lub zgodnie z art. 224 ust. 4 ustawy Prawo własności przemysłowej, do dnia **11.05.2009** w kwocie **390 PLN.**

Podstawa prawna;

- art. 7 ust. 5 oraz art. 2 i art. 8 ustawy z dnia 14 marca 2003r. o dokonywaniu europejskich zgłoszeń patentowych oraz skutkach patentu europejskiego w Rzeczypospolitej Polskiej (Dz. U. Nr 65, poz. 598),
- art. 224 ust 2-4 ustawy z dnia 30 czerwca 2000r – Prawo własności przemysłowej (tekst jednolity: Dz. U. z 2003r. Nr 119, poz. 1117, z późniejszymi zmianami),
- rozporządzenie Rady Ministrów z dnia 29 sierpnia 2001 r. w sprawie opłat związanych z ochroną wynalazków, wzorów użytkowych, wzorów przemysłowych, znaków towarowych, oznaczeń geograficznych i topografii układów scalonych (Dz. U. Nr 90, poz. 1000) zmienione rozporządzeniem Rady Ministrów z dnia 2 marca 2004 r. zmieniającym rozporządzenie w sprawie opłat związanych z ochroną wynalazków, wzorów użytkowych, wzorów przemysłowych, znaków towarowych, oznaczeń geograficznych i topografii układów scalonych (Dz. U. Nr 35, poz 309) zmienione rozporządzeniem Rady Ministrów z dnia 26 lutego 2008 r. zmieniającym rozporządzenie w sprawie opłat związanych z ochroną wynalazków, wzorów użytkowych, wzorów przemysłowych, znaków towarowych, oznaczeń geograficznych i topografii układów scalonych (Dz. U. Nr 41, poz. 241)
- § 27 ust. 2 rozporządzenia Prezesa Rady Ministrów z dnia 20 maja 2008 r w sprawie rejestrów prowadzonych przez Urząd Patentowy Rzeczypospolitej Polskiej (Dz. U. Nr 91, poz. 564)

Otrzymuje:

DR-PL/EP- 1553239
Kulikowska & Kulikowski sp.j.
rzecz. pat. Piotrowicz Alicja
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00-975 Warszawa 12

SPECJALISTA
Małgorzata Stós

UWAGA:
1. Strony, oraz ich przedstawiciele i pełnomocnicy, mają obowiązek zawiadomić Urząd Patentowy RP o każdej zmianie swojego adresu. W razie zaniedbania powyższego obowiązku, doręczenie pisma pod dotychczasowym adresem ma skutek prawny (Art. 41 §1-2 kpa).
2. W postępowaniu przed Urzędem, dla sprawnej identyfikacji poszczególnych spraw i wniosków należy posługiwać się sygnaturą zawartą na pustanowieniach i wezwaniach wraz z podaniem oznaczeń literowych w numerze.
3. Patent trwa 20 lat od daty zgłoszenia.
4. Wszelkie opłaty w tym opłatę za publikację oraz utrzymanie w mocy patentu należy uiszczać na rachunek:
Urząd Patentowy R.P. NBP O/O Warszawa Nr 93101010100025832231000000 wskazując nr EP oraz tytuł opłaty (np. „za 20 rok ochrony").
5. Opłaty za następne okresy ochrony należy wnosić corocznie z góry, najpóźniej w ostatnim dniu upływającego okresu ochrony (w rocznicę daty zgłoszenia). Wysokość opłat wskazana jest w rozporządzeniu (obecnie jest to rozporządzenie Rady Ministrów z dnia 29 sierpnia 2001r. zmienione 2 marca 2004 r.).
6. Opłaty okresowe, o których mowa w pkt 5, mogą być uiszczane nie wcześniej niż na roku przed kolejną rocznicą daty zgłoszenia.
7. Przy jednoczesnym uiszczeniu opłaty dodatkowej w wysokości 30% opłaty należnej, opłaty okresowe, o których mowa w pkt 5, mogą być uiszczane nie później niż w ciągu 6 miesięcy po terminie wskazanym w pkt 6 (termin ten nie podlega przywróceniu).
8. Podstawą do dokonania opłaty jest niniejszy dokument- Urząd nie wystawia rachunków (faktur).
9. Osoby mające siedzibę poza terytorium RP mogą występować przed Urzędem jedynie za pośrednictwem rzecznika patentowego.

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Exhibit 2

Chinese Patent

No. 531872 (Emblem) Patent Office Chop for Printing Tax

CERTIFICATE OF INVENTION PATENT

Title of Invention :STAB-IN CONNECTOR

Inventor(s):Brett W. Sareyka; Yu Lin; William J. Platt

Patent No.: ZL 200410081872.1

Filing Date: December 31, 2004

Patentee(s): WORTHINGTON ARMSTRONG VENTURE

Issue Date: August 5, 2009

After the examination performed according to the Chinese Patent Law, the patent right is granted. The Certificate of Patent is therefore issued and the status of the patent has been recorded on the Patent Register. The patent right will be effective as of the issue date.

The term of the patent is twenty years, counting from the filing date. The patentee should pay annuities according to the provisions prescribed in the Chinese Patent Law and its Implementing Regulations. Payment of annuities for the patent shall be effected within one month prior to December 31, each year. Failure to pay the annuities would result in the expiration of the patent right at the end of the last annual term.

The Certificate records only the legal status of the patent when it is granted. Items concerning the transfer, pledge, invalidation, termination and restoration of patent right, as well as the change of patentee's name, nationality, address, etc., are to be recorded on the Patent Register.

Director General : Tian, Lipu (Official chop of the SIPO)
Date: August 5, 2009

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发明专利证书

Certificate of Invention Patent

中华人民共和国国家知识产权局

STATE INTELLECTUAL PROPERTY OFFICE OF THE PEOPLE'S REPUBLIC OF CHINA

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证书号第531872号

北京市海淀区地方税务局 印花税 代扣专用章 国家知识产权局

发明专利证书

发明名称：穿入式连接器

发 明 人：布雷特·W·萨雷卡；于林；威廉·J·普拉特

专 利 号：ZL 2004 1 0081872.1

专利申请日：2004年12月31日

专 利 权 人：沃辛顿·阿姆斯特朗风险投资公司

授权公告日：2009年8月5日

本发明经过本局依照中华人民共和国专利法进行审查，决定授予专利权，颁发本证书并在专利登记簿上予以登记。专利权自授权公告之日起生效。

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局长 田力普

中华人民共和国国家知识产权局

2009年8月5日

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[19] 中华人民共和国国家知识产权局

[51] Int. Cl.
E04B 9/12 (2006.01)

[12] 发明专利说明书

专利号 ZL 200410081872.1

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[11] 授权公告号 CN 100523400C

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[21] 申请号 200410081872.1
[30] 优先权
[32] 2004. 1. 9 [33] US [31] 10/754,323
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威廉·J·普拉特
[56] 参考文献
US4137641A 1982.3.2
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审查员 何 苗

[74] 专利代理机构 永新专利商标代理有限公司
代理人 王 琼

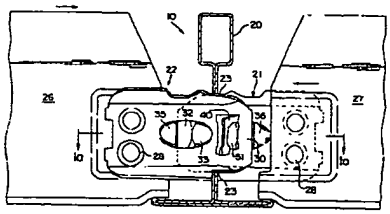
权利要求书 2 页 说明书 11 页 附图 4 页

[54] 发明名称

穿入式连接器

[57] 摘要

一种穿过悬挂的天花板格栅的主梁中的槽与相同的相对连接器进行锁定的穿入式连接器。该连接器具有悬臂的锁定闩锁，该锁定闩锁从连接器的基座沿一个弧枢转，当连接器刺入槽中时它延迟了与槽侧面的接触。



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1.一种连接器，其中该连接器穿过悬挂的天花板格栅的主梁中的槽刺入从而与已经在槽中的与之相对的相同连接器形成锁定，和具有与连接器的基座形成一个整体并且在放松位置远离基座延伸的悬臂弹簧锁定闩锁；

其特征在于，所述锁定闩锁在放松位置沿一个弧远离基座延伸，其中当连接器穿过所述槽时，所述槽的一侧迫使所述锁定闩锁沿着所述弧朝着所述基座弯曲以允许所述锁定闩锁穿过所述槽，以及当连接器已经穿过所述槽时，所述锁定闩锁沿着所述弧折回其放松位置。

2.如权利要求1所述的连接器，其特征在于，所述弧具有0.1016厘米的半径。

3.如权利要求1所述的连接器，其特征在于，所述锁定闩锁在以直杠杆的样式延伸之前，从所述基座形成半径为0.1016厘米的弧，所述锁定闩锁的直部与基座形成42°的角。

4.如权利要求1所述的连接器，其特征在于，所述连接器提供了槽侧面和锁定闩锁之间的接触延迟，在这个延迟期间，穿过槽刺入的连接器上的锥体使连接器能够比没有延迟的情况更快地在槽内垂直定位。

5.如权利要求1所述的连接器，其特征在于，所述连接器提供了槽侧面和锁定闩锁之间的接触延迟，因此当它穿过槽刺入时将会比没有延迟的情况产生更长的杠杆臂来弯曲锁定闩锁。

6.如权利要求1所述的连接器，其特征在于，所述连接器提供了槽侧面和锁定闩锁之间的接触延迟，在这个延迟期间，已经在槽中的

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连接器和将穿过槽刺入的连接器之间产生的侧向摩擦力比没有延迟时所产生的侧向摩擦力小。

7. 如权利要求1所述的连接器，其特征在于，所述连接器提供了槽侧面和锁定闩锁之间的接触延迟，这样在该延迟期间，穿过槽刺入的连接器可以垂直地调整到与已经位于槽内的连接器锁定的位置上。

8. 如权利要求1至7中任意一项所述的连接器，其特征在于，与没有所述连接器的情况相比，在较短的距离上只需要较小的力来使连接器彼此锁定以及锁定至主梁。

穿入式连接器

技术领域

悬吊式天花板广泛地应用于商业和工业建筑物中。在此种天花板中，相互连接的主梁和横梁组成的金属格栅框架通过线从建筑天花板上悬吊下来。这些格栅支撑在其中形成的矩形开孔中的吸声板。

本发明涉及连接器，该连接器在格栅中用于将一对相对的横梁和主梁连接在格栅相交处。

背景技术

具有相互连接到一对板进行支撑的格栅中的金属梁的悬吊式天花板是公知的。例如，作为参考包含在此的编号为US 5,839,246和US 6,178,712的专利中就显示了此种天花板。

此种天花板中的格栅在每个格栅相交处都具有形成一个连接的一对相对的横梁和主梁。

本发明就涉及此种连接。

在此种连接中，每个横梁在其端部均具有连接器，该连接器从主梁的两个相对侧面穿过主梁中的槽推入或者刺入。连接器都是相同的。

首先插入槽中的连接器通过连接器中的悬臂闩锁防止它从槽中退出，其中该悬臂闩锁的形式为具有枢转的柔性片簧。此种闩锁向打开位置偏置，其中该闩锁与连接器基座形成一个整体并且从这里通过冲压形成。当连接器刺穿槽以形成连接时，从连接器的基座以

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一个角度形成悬臂的闩锁在槽侧面的约束下向关闭位置弯曲，但是然后它又折回至它的偏置静止位置以防止连接器从槽中退回。

然后，相对横梁上与穿过槽推入的第一连接器相同的另一个连接器在槽中的缩小的空间中沿着第一连接器刺穿槽。连接器上的闩锁接触槽中接近闩锁枢转的侧面，并且向关闭位置弯曲。

特别是在通过线性刺入运动将第二连接器插入槽中时，需要相当大的功和力来形成连接。

实际上，当第一连接器进入槽时，槽中的第二连接器一进入槽中，该阻力就会立即增大，并且在连接器的整个行程中都会继续存在直到它固定在锁定位置上。

当第二连接器完全插入槽时，两个连接器相互连接。从连接器基座形成的呈球状的并且具有凸轮侧和锁定侧的棘爪以及连接器端会弯曲并且折回以啮合，该啮合有时被称作连接器－连接器锁定或者“握手”锁定。连接器之间的此种“握手”连接可以防止连接器从槽中线性地拉开。连接器通过主梁中的槽沿侧面垂直地保持在一起。

在固定锁定位置中，第二连接器与第一连接器在槽的约束范围内水平地对齐，这样连接器上的锁定棘爪在相同的高度上进行啮合和夹持从而形成连接器－连接器锁定。一般而言，当第二连接器进入槽时必须被抬高或者降低以实现此种水平对齐。因此，连接器的前缘轮廓制成锥形以便在连接器移动穿过主梁的槽的过程中能够引导连接器。

此种连接器是现有技术中公知的并且在例如上述参考的专利中进行了公开。

必须形成众多的此种连接以生成天花板格栅。

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发明内容

对如上所述的现有技术中的穿入式连接器进行改善，这样只需要耗费较小的力和较小的功就可以形成连接。

本发明的连接器穿过悬挂的天花板格栅的主梁中的槽刺入从而与已经在槽中的与之相对的相同连接器形成锁定，和具有与连接器的基座形成一个整体并且在放松位置远离基座延伸的悬臂弹簧锁定闩锁；其特征在于，所述锁定闩锁在放松位置沿一个弧远离基座延伸，其中当连接器穿过所述槽时，所述槽的一侧迫使所述锁定闩锁沿着所述弧朝着所述基座弯曲以允许所述锁定闩锁穿过所述槽，以及当连接器已经穿过所述槽时，所述锁定闩锁沿着所述弧折回其放松位置。

需要较小的功和较小的力的原因是在将第二连接器插入到主梁的槽的减小的面积中的情况下，（1）锁定闩锁和槽的侧面之间的接触中存在延迟，这样在延迟期间，（2）在随后的连接中的元件被定位而向此类定位提供最小的摩擦阻力，并且（3）当元件之间确实产生接触时，元件被定位以提供形成连接的最小阻力。

为了实现上面所述目的，处于其未弯曲位置的锁定闩锁必须从连接器的基座沿侧面充分远地延伸以防止在第二连接器插入之前第一连接器从槽退回，锁定闩锁从连接器基座中沿一个弧枢转，而不是如现有技术中那样进行急剧的弯曲。

即，如在上面的（1）中所述，当第二连接器插入槽中时，这会延迟闩锁和槽侧面之间的接触，并且如在上面的（2）中所述，此种接触还使闩锁从枢转点沿着闩锁更向外，更加接近闩锁端部，生成较长的杠杆臂，这样就需要较小的力来关闭闩锁。

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处于未弯曲位置的锁定闩锁的外端与现有技术中以尖锐的锐角枢转的直闩锁延伸到相同的位置。这个位置是必要的，这样连接器在闩锁穿过槽之后就不能退出。

同样，在上述的（1）中的延迟期间，进入槽中的第二连接器由连接器前端上的锥体垂直地定位，其中第二连接器与槽的顶部或者底部在同第一连接器相同的水平高度上进行啮合，而没有现有技术的连接中所产生的摩擦阻力，而锁定闩锁实质上立即将第一和第二连接沿侧面保持在一起。

通过在第二连接器穿过槽时将它更快地垂直调整到槽中，当锁定棘爪和连接器端通过弯曲在那里啮合时，第二连接器位于如上面的（3）中所说明的位置，从而提供最小的弯曲阻力。

附图说明

图1是两个横梁穿过主梁中的槽连接的右视图，显示了本发明的以连接器－连接器锁定啮合的连接器。

图2是本发明的连接器的右视图，该连接器处于图1中所示的连接状态。

图2a是沿图2中线A－A剖开的本发明的连接器的俯视剖面图，并且带有用于显示本发明的闩锁的放大圆圈部。

图3和3a是与图2和2a对应的现有技术的视图。

图3是现有技术中连接器的侧视图。

图3a是沿着图3中线A－A剖开的现有技术中连接器的俯视剖面图，并且带有用于显示现有技术中的闩锁的放大圆圈部。

图4是表示形成连接时所涉及的力的一组曲线图4a、4b和4c。

图4a是克服形成现有技术的连接时的阻力所需力的曲线图。

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图4b是克服形成本发明的连接时的阻力所需力的曲线图。

图4c是图4a和4b中所示力的重叠曲线图。

具体实施方式

现有技术

作为参考包含在此的编号为US 5,839,246的美国专利就代表了本发明将对其进行改进的连接的现有技术。连接本身和形成此种连接的方法在专利'246中进行了详细说明。

在提供的附图中，在图1和1a中显示了本发明的连接，且在图2和图2a中更清楚地显示了本发明的改进。在提供的连接中，以横截面显示的主梁20在天花板格栅中沿纵向延伸。相同的连接器21和22穿过主梁20的腹板中的槽23刺入并且相互连接。连接器21和22分别由28处的铆钉连接至横梁26和27。

在连接中，会出现下列情形：

（1）连接器21的端部30啮合棘爪31以形成连接器一连接器连接，连接器22的端部32同样如此啮合棘爪33；

（2）连接器21和22上的锁定闩锁40处于未弯曲位置；

（3）连接器21和22上的止挡35和36将端部30和32固定在连接器一连接器锁定中；并且

（4）如在本领域中众所周知的那样，连接器21和22通过连接器的横截面配置侧面垂直地约束在槽23中。

到目前为止所描述的一般配置与现有技术一致。

在形成图1和1a所示的以及在所引用的专利的连接中，第一连接器，不论是连接器21还是22，它们都是一样的，以现有技术中的方

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式穿过槽23推入或刺入。在此处的说明中，假定连接器21首先穿过槽推入。

锁定闩锁40接触槽23的侧面被充分地弯曲，从而以单向运动的方式允许闩锁40穿过槽23并且折回到静止位置。在这个位置上，穿过槽的第一连接器21被夹持在槽23中。

然后第二连接器22沿着第一连接器21穿过槽23的一侧穿过槽23推入。锁定闩锁40再次接触槽23的侧面，但是现在槽中只有较小的空间了，因为已经插入了一个连接器。当第二连接器22穿过槽23被推入槽中时，它使闩锁40向关闭位置弯曲直到闩锁穿过槽，此后它就弯曲打开至静止位置。连接器21和22还在该点形成连接器一连接器锁定，如图1所示，其中棘爪31和33以及梁的端部30和32已经弯曲并且然后折回锁定位置，静止不动。

在这些穿入式连接中，在第一连接器21已经插入槽中之后，当进入槽的第二连接器例如连接器22穿过槽23到固定位置时，会出现下列情形：

（1）第二连接器22在槽23内垂直地调整。

（2）第二连接器22受到槽23的侧面对着第一连接器21的侧向力。

（3）槽23的侧面使第二连接器22上的锁定闩锁40向关闭位置弯曲直到闩锁40穿过槽23，然后它弹开到例如在图1中所示的静止位置。

（4）当锁定棘爪31和33以及第一和第二连接器21和22上的连接器端部30和32彼此接触时，它们就各自弯曲分开，然后折回到锁定位置。

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在现有技术中，上面的（1）至（4）在时间上有重叠或者实际上是同时发生的，这样，完成连接10所需的力和功就不仅是克服上面刚刚描述的（1）、（2）、（3）和（4）所产生的各个阻力之和所需的力和功，而且还包括用于克服当（1）、（2）、（3）和（4）重叠或者同时发生时所产生的摩擦所需的力和功。这些摩擦阻力包括：

a. 当第二连接器22垂直地置于槽23中时，第二连接器22上的闩锁40和槽23的侧面之间的摩擦力。

b. 连接器21和22的基座之间的侧面摩擦力。

c. 当第二连接器22垂直地置于槽23中时，第二连接器22顶部或底部和槽23的顶部或底部之间的摩擦力。

d. 当第二连接器22垂直地置于槽23中时，棘爪31和33以及进入槽中的第一连接器21和进入槽23中的第二连接器22上的端部30和32之间的摩擦力。

在现有技术中，为了试图减小总共所需的力和功，如图3所示，现有技术中的连接器15的前缘上的锥体或者斜坡制成逐渐地倾斜，这样当进入槽23的第二连接器垂直地调整时，摩擦力可以分布在插入的整个长度上。

本发明的改进

本发明的改进充分地减少了克服如下的阻力所需的力，这些阻力为：来自上述（a）、（b）、（c）和（d）的摩擦阻力、在上述的第（3）项中使本发明锁定闩锁40向关闭位置弯曲所需的力，以及在上述的第（4）项中使棘爪31和33以及端部30和32相对于彼此弯曲以产生连接器－连接器互锁所需的力。

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如在现有技术中一样，在本改进中，通过从如图2和2a所见的连接器基座39上进行冲压而继续形成悬臂弹簧片闩锁40。图3和3a中所示的标记为10的现有技术中的闩锁的形式为绕着12处枢转的直杠杆11。它与现有技术中连接器15的基座13形成尖锐的锐角。

在本发明的改进中，在此如图2和2a中所示，本发明的闩锁40在以直杠杆的样式延伸之前，从基座41形成例如为0.1016厘米（即0.04英寸）的半径42。本发明的闩锁40的直部43与基座41形成大约42°的角。锁定闩锁40中的这个曲线增大了第二连接器21或22在47处接触槽23的侧面之前进入槽23的距离46，从而从本发明的此种闩锁40逆着槽23的侧面产生一个阻力。本发明的此种弯曲锁定闩锁40还减少了当本发明的闩锁40穿过槽23后向关闭位置弯曲时闩锁40与槽23的侧面接触的距离48，因为它比现有技术中的直闩锁10在更靠近闩锁端处接触闩锁40。

图2a中显示了本发明的锁定闩锁40的典型尺寸。

另外，本发明的闩锁40与槽23的第一触点在连接到基座41上的本发明的闩锁40上的点51之外，因为本发明的闩锁40的弯曲部的一部分在基座41的平面内延伸并且不会暴露出来与槽23的侧边接触。如图2a中可以看出，点51是切断起始点和本发明的闩锁40的弯曲起始点。

因此，与现有技术相比，当本发明的闩锁40穿过槽时，由槽23的侧面施加的力从比枢转点51更远的地方施加，因此与枢转现有技术中的直杠杆闩锁10相比，需要较小的力来枢转本发明的闩锁40，因为当本发明中的闩锁40在推入连接而接触槽23的侧面时具有更大的杠杆臂。

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因此，与纵弯曲现有技术中的闩锁10相比，只需要较短距离上较小的力来纵弯曲本发明的闩锁40。这样可以基本上做更少的功就可以形成连接。在一个连接中的此种有益的结果会与形成用于悬挂天花板的天花板格栅所需的众多连接相乘。

在本发明改进的连接中，在连接器插入期间，需要垂直地调整连接器，这样当它完全插入时，连接器就垂直地装配到槽23中。

因为压下现有技术中的闩锁10所需的力相当大，并且产生于连接器的前缘附近，所以锥体是逐渐形成的以限制插入中任何一个点处的附加阻力，其中锥体垂直地将连接器引导至它的完全固定位置以便当完全插入时连接器在垂直上处于适当的位置。

因此，即使在产生了其中棘爪弯曲的连接器－连接器互锁的时候，连接器仍然可以垂直地调整，考虑到需要将锥体逐渐地形成而不是骤变的形成，因此产生更多阻力。

在本发明中，连接器21、22前缘处的锥体38以一个较陡的角度制作得相对急剧变化，这样当连接器插入槽23时可以垂直地进行相对直接的调整。尽管更陡的直接调整通常比逐渐插入的需要更大插入力，但是所述需要的力是较小的，而不需要较大的力。力的这一减少是通过本发明的锁定闩锁40与槽23的侧面之间的延迟接触获得的，因为基本没有来自本发明的锁定闩锁40的拉力或阻力。

在插入期间连接器在槽23内的及早垂直定位还可以获得另外一个好处。当棘爪31和33与本发明的第一和第二连接器20和21的端部30和32相接触时，棘爪和端部处于相对于彼此垂直的位置，其中将这些元件沿侧面弯曲到锁定位置的过程中只存在较小的阻力。然而在现有技术中，因为棘爪和端部之间形成接触并且力就施加在偏离

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其最有弹性位置的元件之间，所以弯曲棘爪和端部所需的力还是相当大。

图3并且3a显示了现有技术的连接器，而图2和2a显示了具有本发明改进的连接器。

如图3和3a所示，具有直杠杆11的形式的现有技术的闩锁10相对于现有技术连接器15的基座13以一个锐角进行枢转。在放大部中虚线17表示当现有技术中的连接器15插入槽23时槽23的侧面。现有技术的连接器15在19处与槽侧面碰撞之前行进了距离16，而19与现有技术的闩锁10的端部相距的距离为18。

在图2和2a中显示了带有本发明的闩锁40的本发明的连接器22，它与本发明的连接器21相同。同样，如在图3a中一样，放大部中的虚线17表示当连接器22插入槽23时槽23的侧面。连接器22在47处碰撞槽23的侧面之前行进了距离46。位置47与本发明的闩锁40一端相距的距离为48。

在图4a、4b和4c中以图形示出了本改进优于现有技术的优点。

包括4a、4b和4c的图4显示了同现有技术的连接中遇到的阻力相比带有本发明改善的连接器的连接中遇到的力。

在现有技术中，从80至81的线表示在第二连接器初始插入槽同时闩锁10从它与槽23侧面的初始接触开始弯曲直到阻力在点81处到达它的最大值约10.077千克（约27磅）的过程中所遇到的阻力。

在这个行程中，现有技术中的闩锁10的直杠杆11的触点相对靠近枢转点12。在81到点82的行进过程中，阻力大约下降至3.73千克（即10磅）。在这个下降过程中，现有技术中的直杠杆闩锁10在穿过槽23时会在沿着其直杠杆11的更外处接触槽23的侧面，因此就只需要较小的力，因为杠杆臂比初始接触时更长。

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由于棘爪31和33以及连接器端部30和32在它们形成连接器一连接器锁定时发生弯曲，所以在82处阻力再次上升。阻力上升到点83，在该点处连接器一连接器锁定已经完成，并且所有元件折回至静止位置而不再出现阻力或者运动。

图4b中显示了克服在使用本发明的改进形成连接时所遇阻力所需的力的图形。在图4b中显示了具有本发明的闩锁40的第二连接器22进入槽23的运动，它同现有技术的连接器的运动一样。在90处出现与槽23侧面的初始接触并且升高到91处，在91处阻力大约为5.222千克（即14磅）。当本发明的闩锁40穿过槽时阻力有非常微小的下降。阻力然后升至点93处，此处的阻力大约为5.968千克（即16磅），且随着棘爪31和33以及连接器端部30和32的弯曲而形成连接器一连接器锁定，此后阻力下降至点94，在94处，所有阻力都在连接器一连接器锁定形成之后消失。

通过在连接器上的本改进，在形成连接时所需的力和施加力的距离都明显地大大减小。

图4c将图4a和4b的图形进行重叠，在重叠时将现有技术连接和本发明的连接的锁定位置作为重叠的公共点，即水平轴上的96处。图中的ΔX表示当第二连接器插入槽中时，现有技术的闩锁15和本发明的闩锁40与槽23的侧面17之间接触的延迟距离。同样，图4c也以图形的形式表示出形成本发明的连接所需的力和功比形成现有技术的连接所需的力和功有相当大的减少。

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图1

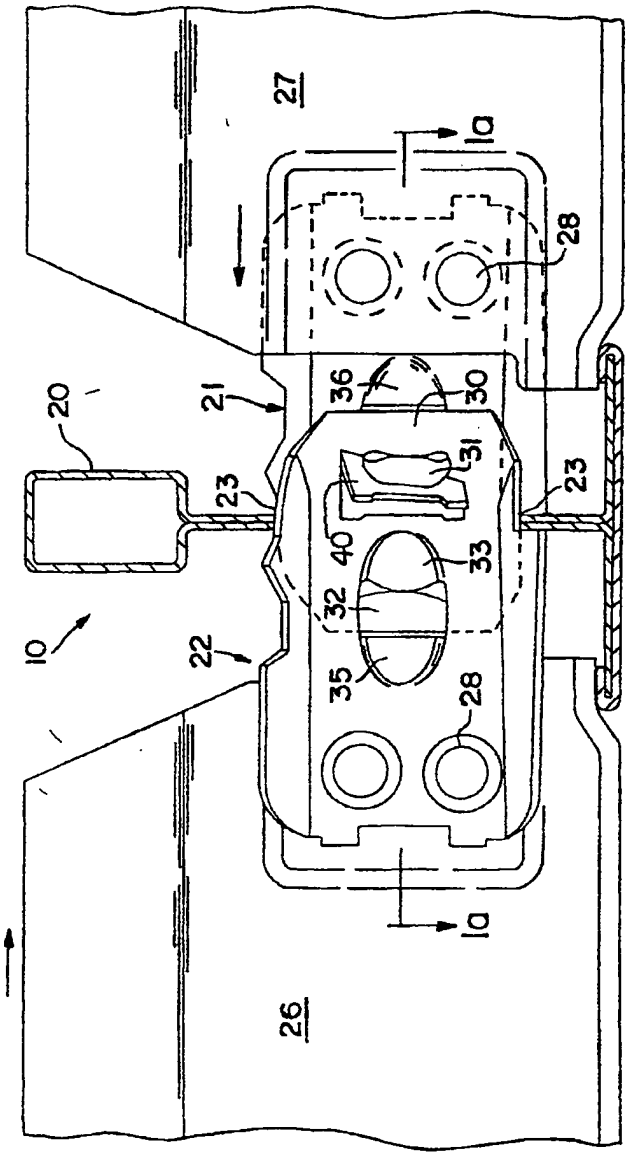
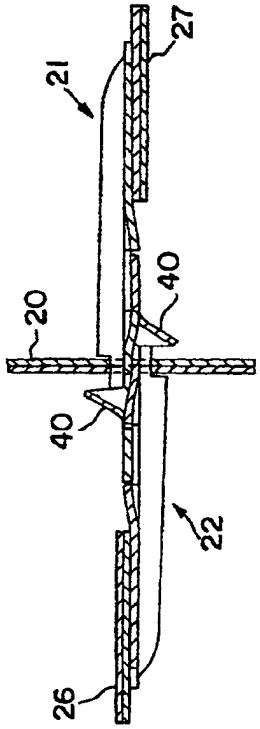

27
1a
28
21
36
30
20
31
23
23
40
33
32
10
22
35
28
1a
26

图1a


21
27
20
40
40
22
26

229

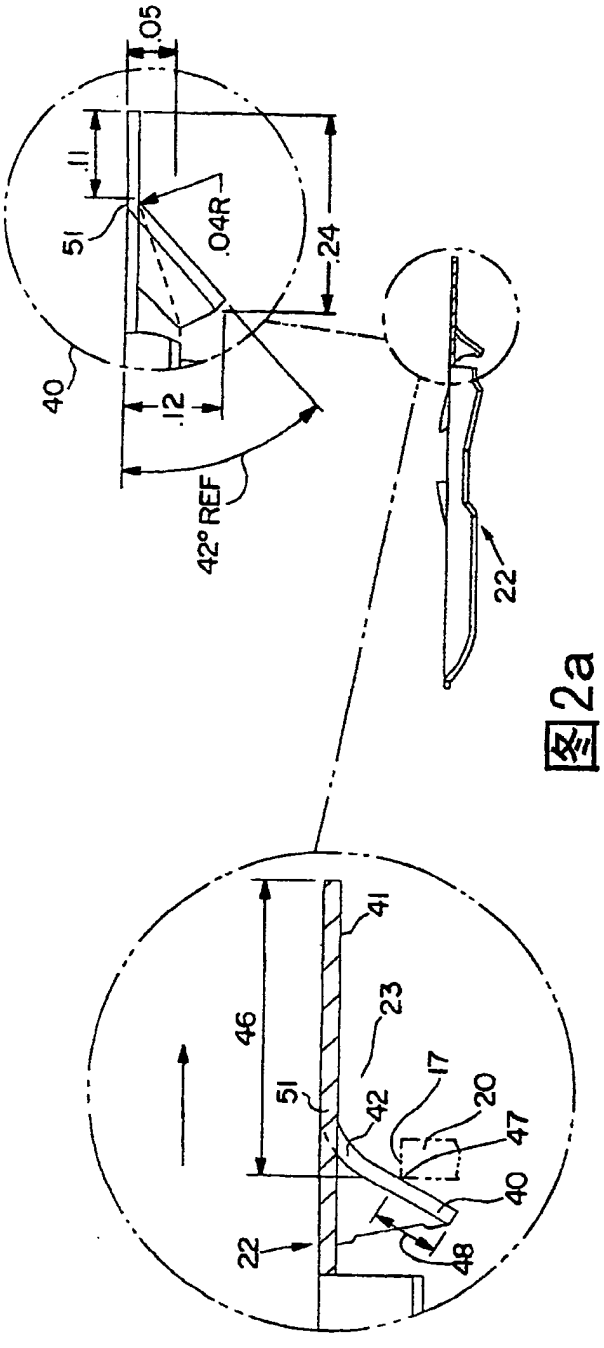

.05
.11
51
.04R
.24
40
.12
42° REF
22
41
46
23
51
42
17
20
47
40
22
48

图2a

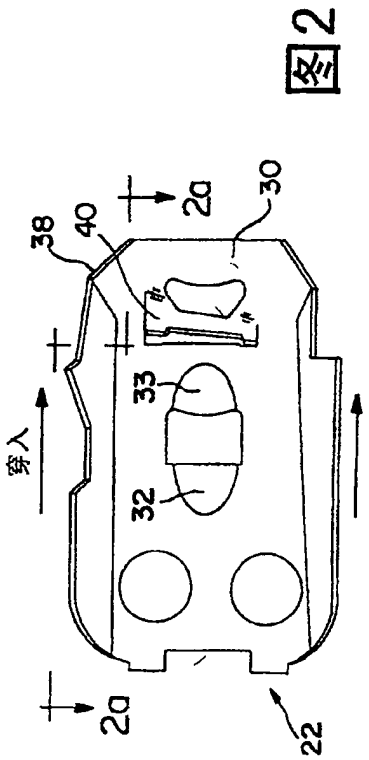

38
40
2a
30
33
穿入
32
2a
22

图2

230

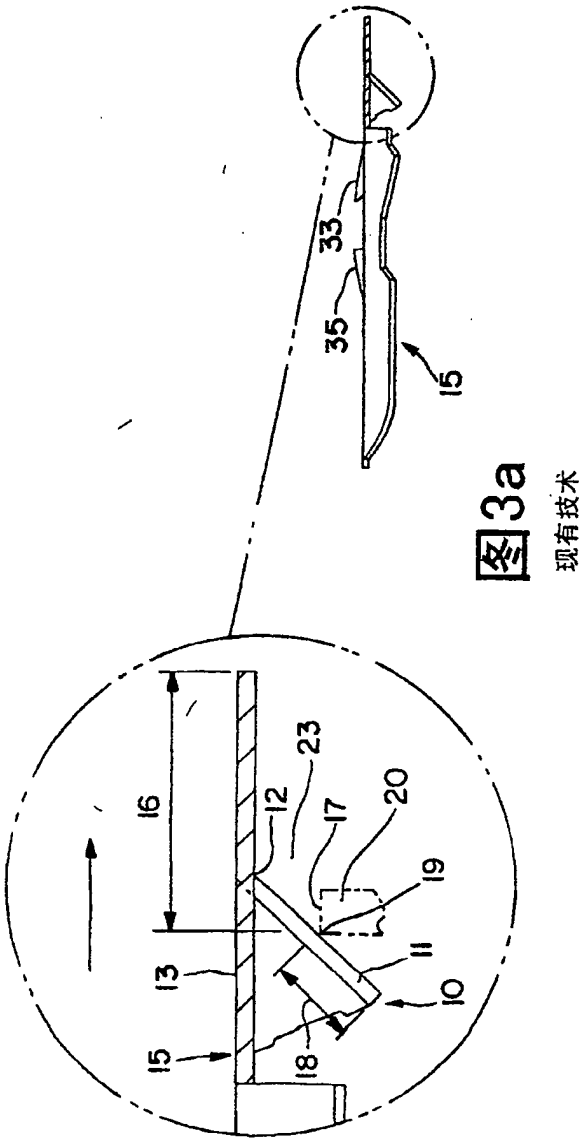


图3a 现有技术

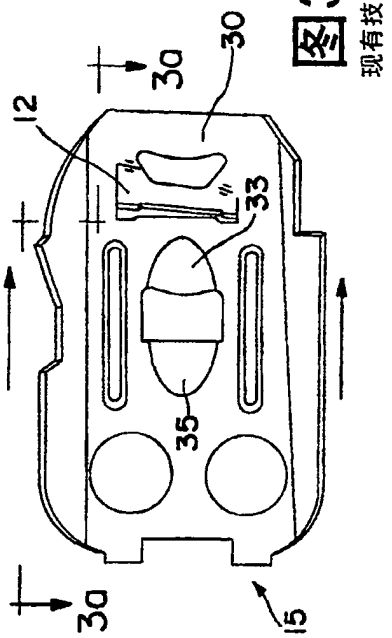


图3 现有技术

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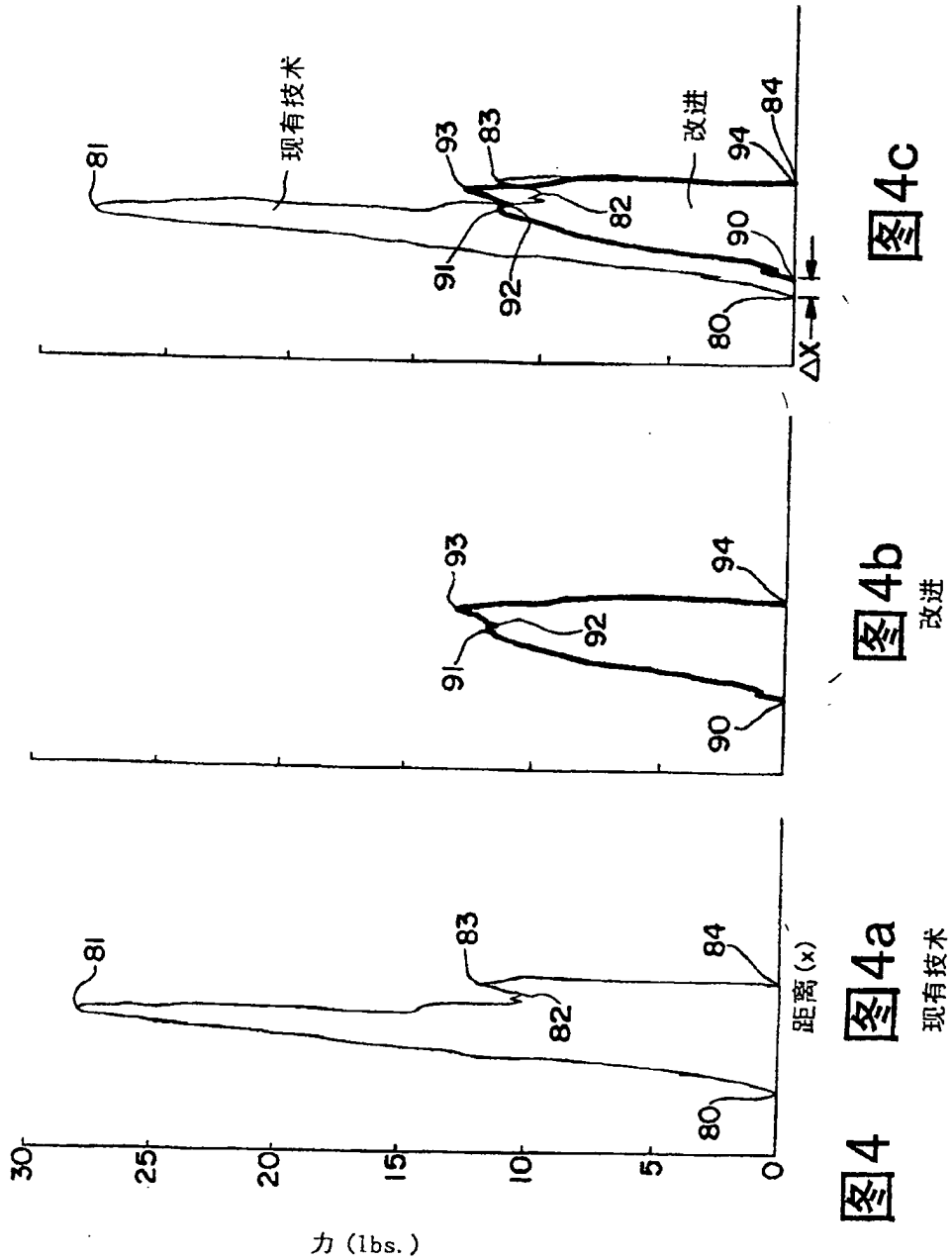

图4c

图4b 改进

图4a 现有技术

图4